pavan

A News Bulletin from CENTRE FOR WIND ENERGY TECHNOLOGY, Chennai

www.cwet.tn.nic.in

C-WET
ISO : 9001 - 2008

ISSUE - 33
April - June 2012

EDITORIAL

Having touched the peak of wind energy installed capacity in the last financial year (3000 plus MW), with carefully monitored quality assurance and reliability of operation and maintenance of Wind Turbines connected to India's utility grids largely owned by State Governments and State Electricity Boards, India has shown to the World that manufacturers of wind turbine generators can have a substantial growth not only in the Accelerated Depreciation regime but also in the Generation Based Incentive regime. Even though the removal of 80% accelerated depreciation is likely to show a business dip in the first quarter as seen and felt by many of the developers and manufacturers in India, Governmental Policies and higher technology WTGs will certainly find a way through the IPP route along with REC combined with RPO/CDM portfolios, in this financial year.

There is a significant effort by the investors in Wind Energy to push for effective power evacuation to facilitate long term sustainability of energy specially from renewable which is dominated by wind so far. In the recent investors meet, there was a good amount of discussion on the project due diligence even in the planning stage and there was a complete analysis of adequacy of assessment of existing technical and policy regulations. Indian Grid Codes "IGEC, 2010" implementation has started in 2010 and its effective implication needs to be studied when wind power forecasting is within the acceptable plus or minus 30% for all the periods of time which is a herculean task in the Indian context due to the weak grid environment with the non-availability of co-related 'SCADA' data on wind and wind generated power. The RRF (Renewable Regulatory Fund) mechanism is likely to put pressure to the State Electricity Boards (generation and distribution companies) to make available the grid for renewable power evacuation by introducing penalty clauses for not evacuating renewable generated power. It is also interesting that this RRF mechanism is likely to play a game changing culture and discipline for orderly generation and scheduling of renewable power in the grid.

C-WET riding at the crest of wave of the expectations of the stake holders in wind energy sector, would not like to go down the wave, for which activities towards R&D, Wind Resource Assessment, Testing and Standards and Certification (S&C) are geared up and the Information Training and Commercial Services (ITCS) and the Solar Radiation Resource Assessment (SRRA) Units are dynamic to deliver the services to the stake holders.

The R&D Unit is consolidating the outcome of three R&D projects one involving Grid interfacing and the other involving power quality issues with the third for the masses i.e. development of the everyman's battery charger. The unit is also monitoring the testing of small wind turbines and empanelment of small wind turbines apart from initiating some new projects on the aero dynamic characterization of aero-foils.

Wind Resource Assessment Unit has been busy continuing the projects on verification, consultancy projects on wind data analysis and a few projects on installation and commissioning of wind masts all over India. Three Scientists from the division have been trained in RISO DTU for "WaSP Certification" programme. All the three members obtained the certificate after rigorous examination. The division is actively planning to make first measurement with the newly acquired LIDAR for gaining the expertise of operation of LIDAR systems for Wind Resource Assessment.

The Testing Unit of C-WET has signed two agreements and pursuing the instrumentation and planning of wind turbine type testing in Kayathar wind farm.

The Standards & Certification Unit is in the process of finalizing the RLMM main List of this financial year with over 21 manufacturers and about 42 models. The unit also has continued renewal of certification for M/s RRB Energy Limited. The Unit has been entrusted the additional work of giving permission for grid connection for prototype wind turbine generators brought into India for testing and certification purposes.

Global Wind Day has been celebrated by C-WET by inviting eminent speakers like Shri Rajeev Ranjan, IAS., Chairman-Managing-Director TANGEDCO who gave a vivid picture of the pros and cons of wind power in Tamil Nadu. The unit is planning for the XII National Training programme devoted only to students also has been active in organizing knowledge sharing lectures along with IWTMA at C-WET Campus apart from the exposure to a number of student visitors to C-WET.

SRRA Unit has completed the quality checks on the data that is flowing from 51 stations spread all over India and is also evolved pricing policy and mechanism for disbursement of quality checked solar radiation data to all stake holders with due approval from MNRE and several Scientists of C-WET are interacting with academia and industry through invited lectures and Conference participation and the highlight of this period is the joint visit of Joint Secretary, Wind Energy, MNRE and Sr. Advisor (Energy), Planning Commission to C-WET's Chennai and to Kayathar Campus. The Scientists presented the various activities to appraise the dignitaries and interacted with them seeking their guidance and support to take C-WET to newer heights in the wind energy field.

I seek constructive criticism from all the readers of this PAVAN issue to take C-WET into a more customer and industry supported, friendly research and delivery institution.

S. Gomathinayagam
Executive Director

Contents

Editorial Board

Developments in R&D UNIT

Testing of Small Wind Turbines

The Unit has undertaken six new assignments for testing of small wind turbines in the current windy season. Instrumentation works are underway at the turbines and measurements are expected to be completed during this windy season at WTRS, Kayathar. Turbines ranging from 1.4 kW to 10 kW will be undertaken for type testing.

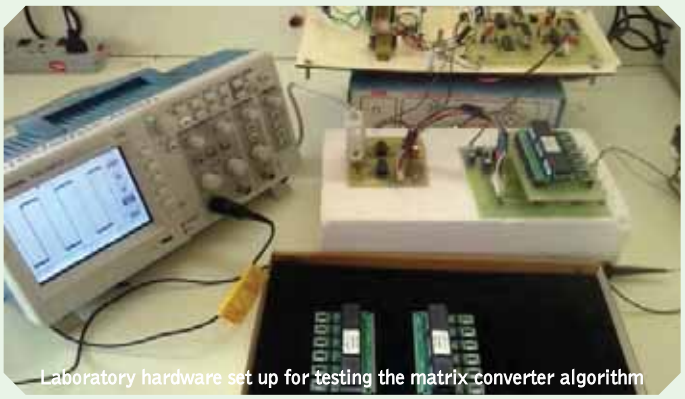
Small Wind Turbines to be installed at WTRS, Kayathar

Empanelment of Small Wind Turbines

The Unit in accordance with the Modified Scheme for the Programme on "Small Wind Energy and Hybrid Systems (SWES)" released by MNRE and in pursuance to the models submitted for empanelment / provisional empanelment had conducted the 7th Empanelment meeting on 20th June 2012. The committee after due diligence has reviewed the various aspects pertaining to empanelment / provisional empanelment and the 7th List of Empanelment of Small Wind Turbine has been released and posted at C-WET's websites.

Study and control of weak grid connected Matrix Converter based DFIG systems

R&D Unit in association with SSN College of Engineering is carrying out a project on "Study and control of weak grid connected matrix converter based DFIG systems". The project's first milestone, the simulation of MATRIX Converter controlled DFIG Systems and associated hardware power module developments has been completed. A detailed system level modeling of the various parts of the wind turbine has been carried out for integrating the matrix converter model with the wind turbine system. Real-time data for wind for a large period of time was collected and a data-based system was modeled to simulate the real wind. Controller design for power control of matrix converter with wind turbine has been performed using the simple PI control technique. Hardware development was initiated with the design and development of a small prototype of matrix converter for 24 V to test Space Vector techniques. An optical fiber communication system for communicating the triggering information from the controller to the IGBT was designed and implemented. Process of developing a complete hardware prototype to operate a 5 HP induction generator using Matrix converter is underway.



Laboratory hardware set up for testing the matrix converter algorithm

Study on power quality issues in grid connected wind farms and identification of remedial measures

The progress of the project on "Study on power quality issues in grid connected wind farms and identification of remedial measures" was reviewed by C-WET & RMK Engineering College at the various sub stations in Coimbatore region where power analysers have been installed at the wind turbine level and the sub-station level to study the power quality issues. A meeting was also organized with the wind farm developers and the technical issues regarding power quality faced by them, failure of thyristors in Soft – starter, failure of Lightning Arrestors etc. were discussed. Accordingly measurement campaign will be extended during this windy season to other wind farms which are having power quality issues, as suggested by the developers.

Peethampally substation where power quality measurements are underway

Power quality Analyzer deployed at substation

Move on in WRA UNIT

During the period of 1st April to 6th June 2012, 3 new wind monitoring stations have been established, 1 station in Karnataka, 2 stations in Tamil Nadu. Presently, 85 wind-monitoring stations are operational in 16 States and 1 Union Territory under various wind monitoring projects funded by the Ministry of New and Renewable energy as well as various entrepreneurs.

Projects on Verification of procedure of wind monitoring have been done for the following sites;

- Kuderu, Yaparlapadu, Payagattapalli, Kondapuram, Alankarpeta, Jampar, Jamanwada-SE, Bhadrampalli, Katrimala, Ramallakota, Ramallakota - West, Mutchukota-North, Bhanukotamala,Kaveli Konda, Wankaner, Akal-NE, Dasalpur, Hebbatam,Kosigi, Uthumalai for M/s.Suzlon Energy Ltd., Pune.
- Tirumalayapalle, Chavaneshwar, South Dhone for M/s. Enercon (India) Ltd., Bangalore.
- Bhadrapuram for M/s.Helios Infratech Pvt. Ltd., Hyderabad.
- Pottipadu,Amidyala, Lottavaram, Vidapanakalle for M/s.Axis Energy Ventures (India) Pvt.Ltd.,Hyderabad.
- Pohra for M/s.RRB Energy Ltd., Chennai.
- Saighar, Kolvan forM/s. TS Wind Power Developer, Satara.
- Aini for M/s. Samarth Multi Trade Pvt. Ltd., Mumbai.
- Rasipalayam-3, Nerimatla, Karoshi for M/s.Gamesa Wind Turbines Pvt. Ltd., Chennai.
- Georai, Aundhi, Manjarwadi, Bharaj for M/s.Maharashtra Energy Development Agency, Pune.

The following consultancy projects have been completed and submitted reports during this period;

- Feasibility report on Site Assessment for Wind Monitoring Studies at four project locations of National Hydro-electric Power Corporation (NHPC), Faridabad for M/s.NHPC Ltd., Faridabad.
- Data analysis for 5 stations (Burugula-1, Burugula-2, Siddanagatta, Kandadhar, Gandhamardhan).
- Prepared Wind Power Density (WPD) map at 50m AMSL at Revangao area in Sangli district, Maharashtra for M/s.Vestas Wind Technology India Pvt. Ltd., Chennai.
- Site Validation & Generation Estimation of existing (21 x 2.1 MW) Wind Farm Project at Sindhgiri, Bellary district in Karnataka for M/s.Suzlon Energy Ltd., Pune.
- Prepared Wind Power Density (WPD) at 50m AMSL at Palsi site in Satara district, Maharashtra for M/s. R.S.India Wind Energy Pvt. Ltd., Gurgaon.
- Site Validation & Generation Estimation of proposed (15 x 2.0 MW) Wind Farm Project at Umrani, Belgaum district, Karnataka for M/s. Gamesa Wind Turbines Pvt. Ltd., Chennai.
- Site Validation & Generation Estimation of proposed (07 x 2.0 MW) Wind Farm Project at Karoshi, Belgaum district, Karnataka for M/.Gamesa Wind Turbines Pvt. Ltd., Chennai.
- Commissioned 80m mast at Guledagudda for M/s.NTPC Ltd., Karnataka.
- Wind resource assessment studies at Panchwad, Chek Sagwani, Burugula-1, Burugula-2, Siddanagatta.

Steps forward in TESTING UNIT

- An agreement was signed between C-WET and M/s. Elecon Engineering Company Ltd. for Type Testing of Elecon 600 kW wind turbine and measurements are expected to start in the month of July 2012.
- An agreement was signed between C-WET and M/s. Jyoti Ltd. for Type testing of WIND JYOTI – SE 850 – 56 / 70 kW wind turbine and measurements are expected to start during the windy season of 2012.
- S.A. Mathew was invited for an interactive discussion with senior officials from Tata Consultancy Services (TCS) at IIT Research Park and delivered a presentation on "Prospects & Challenges of Wind Energy Deployment in India" in 28th June, 2012 at Chennai.

Marching ahead in S&C UNIT

- Agreement has been signed with M/s. RRB Energy Ltd. for renewal of Certificate of V 39-500 kW with 47m rotor diameter wind turbine model under Category-II as per TAPS-2000 (amended). Carried out review / verification of documentation in connection with renewal of Certificate of V 39-500 kW with 47m rotor diameter wind turbine model. Based on the review / verification, renewal of Certificate has been completed and renewed Certificate has been issued to M/s. RRB Energy Ltd.
- The process for next issue of RLMM Main List has been initiated. Documentation / information have been obtained from various wind turbine manufacturers. Review / verification of documentation / information are under progress.
- Working group has been formulated with representatives from various stakeholders to assist C-WET in connection with preparation of Indian standards on wind turbines and other standards related activities.
- MNRE has issued guidelines dated 22nd May 2012 for installation of prototype wind turbine models in India. Various preparatory activities in connection with implementation of the guidelines are under progress.

"Requirements for installation of prototype Wind turbine models in India" has been uploaded in C-WET website.

- The continual improvement and maintaining the Quality Management System are ongoing.

Highlights from ITCS UNIT

The Information, Training and Commercial Services (ITCS) unit was engaged with activities like planning and preparatory works in connection with training programmes, upgrading the infrastructure for good research environment in C-WET by providing IT & Training facilities and also reaching out to the public as well as industries to promote wind energy in the country.

Global Wind Day 2012

"Global Wind Day 2012" was celebrated on 15th June 2012 at C-WET. As part of the programme, a special lecture was organized at the Conference Hall; C-WET on "Success of Wind Energy in Tamil Nadu and its Sustainability" delivered by Shri. Rajeev Ranjan, I.A.S., Chairman-cum-Managing Director, Tamil Nadu Generation and Distribution Ltd. marked this year's Global Wind Day. All C-WET staff and TNEB officials participated in the celebration event. The issues related to the Wind Energy and Tamil Nadu were highlighted in the special lecture.

Shri. Rajeev Ranjan delivering lecture

Before the lecture, the Chief Guest, Shri. Rajeev Ranjan was taken to C-WET campus visit, where the C-WET activities and services explained.

Shri Rajeev Ranjan I.A.S. during campus visit

C-WET has also sponsored for Celebration of 'Global Wind Day' organized by the Indian Wind Turbine Manufacturers Association (IWTMA) in collaboration with Industry partners, Times of India and Global Wind Energy Council. A signature campaign at Marina beach in the morning and FM – Broadcast of awareness message and hosting of a classical and fusion concert in the city were highlights of the event.

Twelfth National Training Course

The Unit had successfully organized 12 National training courses till now including one special training for MNRE & Nodal Agencies. The unit has scheduled 12th National Training Course on "Wind Energy Technology" specially for students during 18th - 20th July 2012 and the preparatory works are on for the successful conduct of the training.

Ninth International Training course

The Unit had successfully organized Eight International training Courses and an special course for AOI engineers. The upcoming Ninth International training on "Wind Turbine Technology and Applications" for ITEC/SCAAP Countries is scheduled during 5th – 27th September 2012 under the Indian Technical and Economic Co-operation (ITEC) and Special Commonwealth Assistance for Africa Programme (SCAAP) organized by Centre for Wind Energy Technology, Chennai, India under the programmes of Ministry of External Affairs (MEA), Government of India with the support of Ministry of New and Renewable Energy (MNRE), Government of India.

C-WET – IWTMA event

C-WET and IWTMA jointly organized a one day workshop on MAST Software of Vortex for Wind Resource Assessment on 4th April 2012 and a one day seminar on Innovation Impacts on Wind Turbine Simulation and Test process by LMS International on 25th June 2012. Professionals from wind industry, C-WET Scientists & Engineers attended the seminar.

Visitors to the Campus

During the period from April to June 2012, the following visits were arranged. A brief presentation about basic wind energy and C-WET activities & services were made for student visitors and the campus facilities were also showcased. The visitors were students, delegates from foreign countries and stakeholders.

- 42 participants from Bangladesh and Nepal journalist & Editors on 18th May 2012.
- 32 students from Institute of Energy studies, Anna University, Chennai on 4th May 2012.
- 52 Engineering students from Rajalakshmi Engineering College, Chennai on 4th April 2012.

Students during the campus visit

Advances in SRRA

A second Technical Committee meeting was held under the chairmanship of Joint Secretary (JNNSM), MNRE, on "Review and Performance of SRRA" project at MNRE, New Delhi on 21st May 2012. QC statistics and monthly Quality Check of reports have been generated for the month of April and May 2012 with Mat lab for all 51 SRRA stations under Solar Radiation Resource Assessment project. SRRA station at IIT-Rajasthan has been relocated to its Old campus on 21st May 2012. Project proposal for establishment of additional 60 SRRA stations has been provisionally approved by MNRE.

Training Program at PDPU,Gandhinagar

A training program on the "Functioning and Maintenance of SRRA Stations" for the station in-charges of Gujarat, Madhya Pradesh, Chhattisgarh, Maharashtra (Pandharpur) and Jammu & Kashmir was organised at PDPU, Gandhi Nagar on 26th April 2012.

Windy Acts at WTRS UNIT

- Replacement of High Speed Pinion Shaft in 200 kW MICON wind turbine of C-WET Research Wind Farm at Kayathar is under progress.
- Preparation of test bed for testing of WIND JYOTI - SE850-56/70 Kw Wind Turbine is under progress at Kayathar.

Several technical visits to WTRS are coordinated and the following are the specific visits:

- 31 students of Post Graduate Diploma Programmes on Wind Power Development and Wind Resources Analysis from AMIRTHA College of Engineering, Coimbatore visited the R&D facilities at WTRS, Kayathar.
- 42 students from PSG college of Engineering, Coimbatore visited the R&D facilities at WTRS, Kayathar.
- 10 days In-Turn ship / Field Training Programme conducted for 3 students from National Institute of Technology, Suratkal, Karnataka State at WTRS, Kayathar.

Invited lecture delivered / meeting attended by C-WET Scientists in external forums

Dr. S. Gomathinayagam
Executive Director, C-WET

- SPC meeting at New Delhi on 12th April 2012.
- India Wind Energy Summit on 20th April 2012.
- Key note address at World Renewable Energy Tech Congress on 26th April 2012.
- Sub Committee Meeting on preparation of the draft policy guidelines on development of off-shore wind energy project at MNRE New Delhi on 30th April 2012.
- Technical Committee Meeting for installation of 60 Additional Stations on Phase II of SRRA on 5th May 2012.
- 2nd Scientific Committee Meeting at National Aerospace Lab, Bangalore on 16th May 2012.
- 3rd Organizing Committee Meeting of IWTMA at Hotel Trident, Chennai on 19th May 2012.
- Chief Guest – Inauguration of R&D Centre at S.A.Engineering College, Chennai on 29th June 2012.

Research & Development

Rajesh Katyal, Scientist & Unit Chief

- "Small Wind Turbine and Hybrid System" at Amrita School of Engineering, Coimbatore, in connection with HRD sub-group program on 17th April 2012.
- Key Note addresses at the National Seminar on "Exploring Research Areas in Harnessing Wind Energy" on 28th April 2012 at VIT University, Chennai.
- "Lightning protection – Wind Resources and Way-forward for development of offshore wind energy" at symposium organized by M/s. Dehn India on 9th May 2012.

Deepa Kurup, Scientist

- "Power Quality Issues, Classifications, Assessment" during one Week Short Term Training Program on "Modelling & Simulation of Wind Turbine Generators for Power System Studies" organized by Sri Lakshmi Ammal Engineering College, Thiruvancheri, Chennai on 11th May 2012.

Wind Resource Assessment

K.Boopathi, Scientist & Unit Chief (i/c)

- Meeting with Chairman & Managing Director, JNPT, Mumbai for 50 MW wind farm development at Maharashtra - DPR Preparation and discussion.
- "Wind Resource Assessment and Techniques" in connection with the "International workshop and Conference on Renewable Energy and Climate Change – Exploring Opportunities for Sustainable Development - IWCRECC – 2012" at Madurai Kamaraj University on 6th April 2012.
- Meeting on Renewable Energy (Wind Energy) held at Scope Complex, Ministry of New & Renewable Energy, New Delhi on 2nd May 2012.
- Pre bid meeting held at Neyveli Lignite Corporation, Neyveli on 25th & 26th May 2012 and answered various queries raised by the various bidders.

A.Hari Bhaskaran, Scientist

- Participated in the pre bid meeting of Southern Railways.
- Tamil Nadu Offshore meeting held at the Chamber of Principal Secretary, Department of Energy, Government of Tamil Nadu on 21st May 2012.

T.Krishnan, Junior Engineer

- Participated in the Pre bid meeting of Southern Railways

Wind Turbine Testing

S. A. Mathew, Scientist & Unit Chief

- Invited as a guest and delivered a lecture on the topic 'Wind Turbine Testing' at Amrita School of Engineering, Coimbatore on 17th April 2012.
- Guest speaker during the session of Symposium for the wind industry "General Overview on Wind Industry" organized by DEHN India held at Radisson Blue Chennai City Center, Chennai on 9th May 2012.

M.Anwar Ali, Scientist

- "Grid Interaction of Wind Turbines" at BHEL campus, BHEL, Ranipet on 7th June 2012.

M.Saravanan, Scientist

- "National Conclave for Laboratories" organized jointly by CII and NABL at New Delhi on 4th and 5th April 2012.

Bhukya Ramdas, Scientist

- "National Conclave for Laboratories" organized jointly by CII and NABL at New Delhi on 4th - 5th April 2012.
- "FPGA design and on-chip debugging" conducted by National Institute of Electronics and Information Technology (NIELIT) at Anna University Campus, Chennai during 28th May to 8th June 2012.

Information, Training & Commercial Services

P. Kanagavel, Scientist & Unit Chief (i/c)

- "Wind Power Development in India" in the international workshop and conference on Renewable Energy and climate change-Exploring opportunities for sustainable Development – IWCRECC – 2012 at Madurai Kamaraj University, Madurai during 5th – 7th April 2012.

Solar Radiation Resource Assessment

Dr. G. Giridhar, Scientist & Unit Chief

- Technical Committee meets at TEDA office, Chennai on 4th, 9th, 16th, 25th, 30th April 2012 and 29th May 2012.
- 2nd Technical Committee meet in connection with SRRA Phase II held under the chairmanship of Joint Secretary (JNNSM), MNRE, on 'Implementation of Phase-II SRRA Stations' at MNRE, New Delhi.
- 3rd Technical committee meet was held on 13th June 2012 at C-WET, Chennai under the chairmanship of Dr.S.Gomathinaygam, ED, C-WET for finalization of technical specifications of the tender for Implementation of Phase II SRRA stations.

R.SasiKumar, Scientist

- "Solar Radiation Resource Assessment" at the International Conference on "Renewable Energy and Climate Change" at Kamaraj University, Madurai 5th April 2012.
- SRRA Overview' in the training program conducted at Pandit Deendayal Petroleum University (PDPU), Gandhinagar on 26th April 2012.

Wind Turbine Research Station

A. Mohamed Hussain, Scientist & Unit Chief

- "Recent Trends in Renewable Energy Sources – Its Application" at KLN College of Engineering, Sivaganga District, Tamil Nadu
- "Operation & Maintenance of Wind Electric Generators and Wind Farm" at Cape Institute of technology, KanyaKumari District., Tamil Nadu.

Visits Abroad

S.R.Hasan Ali, Asst Engineer, WTTS Kayathar

- Participated in the 2nd phase of Advanced International Training Programme 2012 on Wind Power Development and Use organized by SIDA, Sweden conducted by LIFE Academy, Sweden during April16th – May 10th 2012.

Dr. S. Gomathinayagam, Executive Director

- On behalf of MNRE, nominated to represent in the ESMAP Knowledge Exchange Forum – 2012 in Washington DC, on 9th May 2012, by World Bank.

S.A.Mathew, Scientist & Unit Chief

- IEC TC 88 Certification Advisory Committee Test Laboratory Subgroup Meeting held at the TUL NEL, Glasgow, UK during 22nd – 23rd May, 2012.

Wind Resource Assessment Unit

- Mr. K. Boopathi, Unit Chief (i/c), Mrs. G. Arivukkodi, Assistant Engineer & Mr. B. Krishnan, Junior Engineer from WRA unit attended WAsP, WAsP Engineering course and WAsP Certification at RISO- DTU, Denmark from 12th to 21st June 2012.

Joint Secretary, MNRE & Sr. Advisor (Energy), Planning Commission visit to C-WET

The Joint Secretary, MNRE, Shri. Alok Srivastava, I.A.S., & Shri Anil Jain, Sr. Advisor (Energy), Planning Commission visited C-WET on 28th June 2012 and interacted with Executive Director, Unit Chiefs and Scientists. All the Unit Chiefs made presentations highlighting their respective unit's activities and progress since the beginning of C-WET. After the brief presentation by the Executive Director a visit to all the units infrastructure facilities were arranged, and expressed their appreciation for C-WET's effort so far and offered valuable suggestions towards the future development.

Also they had visited WTRS/WTTS, Kayathar along with Executive director and General Manager (F&A) on 29th June 2012 and dedicated the Battery Operated Vehicle for faciliation of man & material (Equipment) movement, within C-WET's research wind farm & WTG test beds.

NEW GENERATION CONDITION MONITORING SYSTEM FOR WTG

Mr.Samuel Rajkumar, General Manager, Romax Solutions Pvt. Ltd., Pune Email : Samuel.Rajkumar@romaxtech.com

Wind farm operators have been aware of the frustration of planning operation and maintenance (O&M) activities. There was a feeling that they were always reacting to failures. Not knowing when gearboxes might fail make the business planning difficult, Condition Monitoring System's (CMS) in the past have provided just a few months alert before the failure. Wind farm operators have been crying out for a long time expecting the warning alerts much before component failure.

The next generation of CMS is being created to tackle head on such operator challenges in O&M activities, delivering a defined step change in enabling wind asset owners to visualise their fleet condition and to predict the remaining operating life of wind turbines down to subcomponent level.

Wind farm operators should believe that if you want a wind farm, or any other power generation asset, to achieve maximum output, you need to know both its current condition and what its future condition will be, you also need to know the necessary changes required in order to enhance future performance.

The ability to identify, predict and resolve maintenance issues at an early stage before they become significant is directly related to wind asset profitability and return on investment.

Cost savings in operations and maintenance have a significant impact on reducing the Cost of Energy (CoE) though Industry data shows that improvements in availability have a significantly larger impact. By focusing on improvements in availability the resulting CoE reductions can be more than ten times effective in reducing CoE than on OPEX savings.

Therefore the new breed of CMS's is 'modelling out' the reasons for failure and creates predictive maintenance (PdM) tools that are accurate, reliable and easy to use. It is also important to ensure that maintenance is undertaken at the optimum time, something that all CMS's must do to improve the profitability.

The new breed of CMS should comprise of at least three core elements, Intelligent Diagnostic System (iDS), Inspection and Analysis which should draw on deep rooted experience of forensic engineering, studying machine behaviour and field services to tackle maintenance issues.

Every iDS must provide the Wind farm operator with a powerful diagnostics platform which provides precise visualisation of the fleet condition to asset managers and vibration monitoring experts.

By utilising SCADA the CMS will also provide Wind farm operators near real time visualisation of wind farm performance and interfaces with ERP systems such as SAP to enable links between maintenance works and performance changes to be easily identified as well as the optimisation of work scheduling and commercial control.

Within the next generation of CMS the iDS will be hardware neutral, which means it can integrate data transmitted from multiple manufacturers' CMS hardware, presenting it in a single, unified and easy to understand dashboard. Therefore the provision of trend analysis together with the identification of potential problems will be identified far more quickly and easily than is possible via multiple system interfaces, something that will prove cost effective for Wind farm operators.

Experience of modelling, analysing and understanding WTG behaviour and the vibration signatures of rotating machinery are also a critical component of this new generation of CMS as incorporation of advanced diagnostic rules into the iDS, which identifies telltale sign combinations long before they turn into serious faults is another benefit for the improved profitability of the Wind farm.

When looking into your replacement CMS, Wind farm operators must identify whether their iDS comes preloaded with diagnostic rules covering many major wind turbine manufacturers' machines and model type of faults. If not done this way then Wind farm operators will soon find out another cost drainer – the purchase of a second system.

To ease the constant influx of data to the operator, the next generation of CMS will display an 'alarm' for each turbine within a wind farm as well as alarms for the gear, bearing, shaft and sensors of every drive-train with detailed diagnosis results of all alarms being shown in a 'trend' graph.

CMS alone is limited in its ability to pin-point the location of potential faults, with most only being able to indicate the sensor closest to the irregular vibration signature. To look at this in more depth for the profitability of the Wind farm operator, the identification of specific component faults using CMS data can only be achieved by vibration analysis experts and even then it may take them many hours to identify and locate the most common faults. This is something that each Wind farm operator should be aware of as it's a costly affair.

Through the intuitive user interface, the next generation of iDS will enable both asset manager and vibration analysis experts to identify the specific problem area immediately down to subcomponent level, something which is extremely cost effective for the Wind farm operator. Therefore specific analysis enables pin-point accuracy and thus reducing precious Wind Turbine Generator (WTG) down time.

Further developments of CMS will expand on how current systems are geared towards conventional planetary drive-trains, although software for direct-drive transmissions appears to the next development objective.

Further developments of CMS's will incorporate condition monitoring of elements outside the drive-train, with the future generations taking in componentry, including rotor blade pitch and yaw systems.

Independently managed WTG's are rare although some of the WTGs have expired warranties managed by a totally automatous companies, thus reducing internal monitoring errors such as incorrect O&M activities which are 'covered up' by the Wind farm operator.

As turbines become larger and more sophisticated, operational costs and the impact on revenue resulting from bad decision making will be very significant. Offshore and remote wind farms involve enormous investment and maintenance is inevitably more challenging. At 0.1 – 0.2 failures per year (1 failure per 5 – 10 years) the fact is that currently the drive-train failure rate is too high for example for offshore turbines.

With the offshore wind power market forecast to increase to 9.6 per cent of total installed capacity by 2015, clients should have a far greater insight into their assets and significantly increase their yield.

Primary Causes of Turbine Failure

With the first large turbines (multi MW turbines) coming out of the warranty period, there are a number of reliability issues being reported. The main area of turbine downtime is the drive-train, which includes the gearbox, generator, associated bearings.

There are three primary causes of failure.

The first one arises from maintenance issues. This is not always the fault of the operator but there are occasions when turbines do not lend themselves to component maintenance.

There are examples where a gearbox is well designed but the subsystem requiring maintenance not planned so well. Similarly, if during assembly, parts were not aligned properly then this could lead to problems in future. Wind farm operators encounter a number of quality issues related to manufacturing on a daily basis, therefore Wind farm operators must not be afraid to quality check the manufacturing facilities, failures and installation standards of WTG suppliers.

Second area is related to poor siting which can cause turbine reliability issues, particularly, where turbines are subjected to higher than the necessary wind loads.

Third area is related to design flaws. Where there are issues running through a product line and there could be multiple failures resulting in significant consequences.

Blade issues are not so common, although they present a significant cost item when they do occur as the remedial work causes considerable downtime. Offshore operations requiring a blade swap out would be very costly.

A principal focus for any supplier of services to a Wind farm operator is quality of O&M on the WTG. Products that will help schedule the flow of maintenance and to provide quality assurance of maintenance action are currently being developed for Wind farm operators. This will allow operators to document and monitor both improvements and defects identified during the maintenance process, something that will prove extremely cost effective for operators by reducing WTG down time and improving WTG profitability.

Operator Controlled WTGs

The next generation of CMS is being directed from the technology, rather than the service or product side providing the distinct possibility of further independent analysis of WTG's. This will provide an independent end-to-end solution, from a condition-monitoring hardware solution to a fleet monitoring service. Clients should put the processes in place and provide the training they need in order to operate their assets to optimum capacity thus keeping the ultimate goal of increasing profitability.

The next generation solutions are giving owner the control of everything rather than being tied to one service provider. Owner-operators can understand their assets and manage them on their own terms, so they are not tied into a hardware vendor. It is a technology-based offering that empowers the asset owner rather than tying them into a product or service.

A Critical Time

The next generation of CMS is now being launched just in time as the first generation of 1.5MW to 2.5MW class wind turbines enters maturity, there are increasing evidences of main bearing failures across a variety of turbine types, turbine manufacturers and bearing types. Failures have been experienced by operators in the US, Europe and Asia and in many cases a number of failure modes and symptoms have been found to be consistent across the fleets.

The nature of these WTG's is very different to smaller WTG's in terms of cost to operate, size and revenue generated. Technology levels are higher as are the value of assets.

Correct Wind farm operational management is more important than ever and correct operation would mean increased profitability.

Published by :
CENTRE FOR WIND ENERGY TECHNOLOGY (C-WET)
An autonomous R&D Institution established by the Ministry of New and Renewable Energy (MNRE), Government of India to serve as a technical focal point of excellence to foster the development of wind energy in the country.
Velachery - Tambaram Main Road, Pallikaranai, Chennai - 600 100.
Phone : +91-44-2900 1162, 2900 1167, 2900 1195 Fax : +91-44-2246 3980
E-mail : info@cwet.res.in Web : www.cwet.tn.nic.in

If you would like to continue receiving the PAVAN Newsletter,
kindly send a request for registration to the address mentioned above (or) kindly send back the duly filled in feedback form.