

EDITORIAL



While the wind sector rejoices revival, it's my pleasure to announce that Centre for Wind Energy Technology (C-WET) is renamed as National Institute of Wind Energy (NIWE), Chennai, as approved by the Ministry of New and Renewable Energy (MNRE), Govt. of India.

NIWE/CWET places on record his valuable contribution to the wind sector by Joint Secretary (Wind Energy), Shri. Alok Srivastava, IAS, moving on transfer, and would like to welcome our new Joint Secretary (Wind Energy), Ms. Varsha Joshi, IAS, who would assume charge at MNRE.

Energy is the most essential element of socio-economic development and nations' economic growth. Renewable energy sources in India play an immense role with 12.5% of 251 GW of installed power generation capacity. The Renewable Energy sources will not only enhance energy sustainability but also helps in many ways such as mitigation of climate change, swift development of rural areas, improved health status and will be the best way to move towards environmentally benign development. Today, India is the ninth largest economy in the world, driven by a real GDP growth of 8.7% in last 5 years, of which energy sector has a key role. According to working group on power, total investments for the Indian power sector is estimated at US \$253.6 billion. Government is focusing on raising funds through measures, such as credit enhancement schemes, National Clean Energy Fund and infrastructure debt funds. A major part of the funding is expected to come from commercial banks, public financial institutions, infrastructure / power finance institutions, international investments and bilateral credit and equity markets. With restoration of accelerated depreciation for wind, there is a lot of activities in the wind sector.

During this period Hon'ble Minister of State (Independent Charge) for Power, Coal and New & Renewable Energy, inaugurated an R&D Conclave on New and Renewable Energy held on 5th August 2014 at Vigyan Bhavan, New Delhi.

Presently, R&D/NIWE is carrying type testing of 7 small wind turbines at Wind Turbine Research Station (WTRS), Kayathar. A review of the progress in testing of wind turbines was conducted and the Eleventh List of approved small wind turbine vendors with MNRE/NIWE was issued. NIWE with the association of Power Research and Development

Consultants Pvt. Ltd., Bangalore, has initiated a project for measurement of power quality on a 225 kW wind turbine as per the requirements of IEC 61400-21. The unit has also initiated establishment of Phasor Measurement at WTRS, Kayathar. This measurement kit will enable synchronized recording of phasors at the rate of 25 - 50 frames per second in a centralized server and thus identify operational field power system transient disturbances.

The Wind Resource Assessment (WRA) Unit has very actively established 2 new monitoring station in Uttar Pradesh. Many consultancy projects have been completed. A few to mention are Technical Evaluation for the proposed 76 MW wind farm projects, wind power density map for 3 sites etc. WRA is actively pursuing its efforts towards offshore wind power development, repowering projects, and wind power forecasting.

The Wind Turbine Testing (WTT) Unit has been progressing with type testing projects together with site feasibility studies and power curve verification. NIWE's International course participants / students and staff taking part in training program have visited the various field activities at WTRS, Kayathar.

The Standards and Certification (S&C) Unit has taken up for renewal of certification and issued certificate "PAWAN SHAKTHI - 600 kW" wind turbine model of M/s RRB Energy Ltd., under Category II as per TAPS 2000. The Unit reviewed and verified documentation provided by various wind turbine manufacturers for more than 55 wind turbine models in connection with Revised List of Models and Manufacturers (RLMM) of Wind Turbines - Main list and the same has been released.

Information, Training and Commercial Services (ITCS) Unit has successfully organised the 16th National Training Course on 'Wind Energy Technology'. The unit has successfully completed the 14th International Training programme on 'Wind Turbine Technology and Applications'.

A comprehensive campus surveillance system with CCTV cameras at NIWE campus has been put in operation. NIWE scientists have attended meetings and delivered lectures on invitation, in external forums/Academia.

NIWE rededicates itself to serve the nation with a larger wind and solar mission and invites your valuable suggestions / feedbacks to incorporate the same in our future protocols, with the Industry focus.

S. Gomathinayagam
Director General

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Research and Development

Testing of Small Wind Turbine

There are 7 small wind turbines of various capacities under test in WTRS, Kayathar. The Meeting of the Committee for empanelment of Small Wind Turbines to review the progress in testing of Wind Turbines was conducted and the Eleventh List of Empanelment of Small Wind Turbines with MNRE / NIWE was issued and uploaded in the website for the benefit of the stakeholders.

Measurement of Power quality

The Unit in association with Power Research and Development Consultants Pvt. Ltd. had initiated a project for measurement of power quality on a 225 kW wind turbine as per the requirements of IEC 61400-21. The measurements were carried out during July 2014. The measurements mainly cover voltage fluctuations, flicker, harmonic measurements and reactive power measurements. The data analysis and report preparation is in progress.

Installation of Phasor Measurement Unit at Wind Turbine Research Station (WTRS), Kayathar

The Unit has initiated work on the installation of Phasor Measurement Unit at WTRS, Kayathar in association with SRLDC, Bangalore. Dedicated optical fibre link will be laid to WTRS, Kayathar to facilitate this. The Phasor Measurement Unit will enable synchronised recording of phasors at the rate of 25-50 frames per second in a centralised server and thus identify power system disturbances.

Wind Resource Assessment

During the period of July to September 2014, 2 new wind monitoring stations have been established in Uttar Pradesh and 7 wind monitoring stations have been closed down (2 in Maharashtra, 4 in Uttarkhand & 1 in Uttar Pradesh). Presently, 159 wind-monitoring stations are operational in 16 States and 1 in Union Territory under various wind monitoring projects funded by the Ministry of New and Renewable Energy (MNRE) as well as various entrepreneurs.

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

- Technical Evaluation for the proposed 76 MW wind farm projects.

- Verification of procedure of wind monitoring for 18 sites.
- Wind Power Density Map for 3 sites.
- Wind Monitoring Study for 1 site.
- Repowering of existing wind farm for 1 site

R&D Projects progress in WRA Unit

Design and Development of a Photonic System for real time remote monitoring of Wind and other Air Parameters

- First Review Meeting on “Design and Development of a Photonic System for Real Time Remote Monitoring of Wind and other Parameters” has been conducted on 12th August 2014 at NIWE premises.
- The indigenously designed and developed Photonic laser anemometer has been validated with 120 m met mast, SODAR, LIDAR instruments at Kayathar during 25th to 27th August 2014.

Power Curve Measurement at Kayathar

Towards exploring the usage of LIDAR in power curve measurement, the LIDAR is being deployed at Kayathar at 2.5 D (Rotar diameter) in front of the 2 MW Kenersys machine owned by NIWE. The measurement is expected to throw some light on LIDAR accountability in Indian conditions.

Offshore at Dhanushkodi

100 m mast data has been validated with the LIDAR instrument at Dhanushkodi during 18th to 24th August 2014. The study has been performed to understand the LIDAR and mast correlation on wind measurements. The study reveals very good correlation between the LIDAR & mast.

Repowering of Existing Wind Farms in Tamil Nadu

Repowering is to use the existing renewable energy resources on site more efficiently, respectively in a technically adapted or improved manner. Repowering of Existing Wind Farms in Tamil Nadu since many wind farms have come into existence more than 20 years back and occupy some of the high potential sites. Under the project, the required Wind farm details as well as neighboring wind farm details (capacity, size, WTG Characteristics etc) in Kanyakumari, Tirunelveli & Tutukudi districts have been collected.

Wind Power Forecasting

Based on the real time generation data provided by M/s. REGEN, an automation system is created to fine tune the forecasting model. In addition, in order to further validate the model, NIWE processed the Kandke Wind farm generation data based on the training provided to NIWE officials at Barcelona and provided the data through FTP to M/s. Vortex. Presently, validation of the model is in progress.

Wind Resource Assessment in uncovered/new areas

Under the project “WRA in uncovered/new areas 2013-14”, Installation & Commissioning of two 80 m WMS at Uttar Pradesh has been carried out and data acquisition is in progress since August 2014.

Interim reports have been prepared and sent to MNRE for the following projects:

- “WRA in uncovered / new areas (2006 - 07) NE region”,
- “WRA in uncovered / new areas (2008 - 09)”,
- “WRA in uncovered/new areas (2009 - 10)”
- “WRA in uncovered/new areas (2010 - 11)”
- “WRA in uncovered/new areas (2010 - 11) NE region”
- “WRA in uncovered/new areas (2011 - 12)”

Estimation and Validation of WPP at 100 m level of 7 States in India

Wind resource assessment Unit has established 73 (10 in Andhra Pradesh, 12 in Gujarat, 11 in Rajasthan, 13 no's in Karnataka, 8 in Maharashtra, 7 in Madhya Pradesh and 12 in Tamil Nadu) Wind monitoring stations under the project ‘Estimation & Validation of Wind Power Potential at 100 m level in 7 States of India’ and the data acquisition is in progress.

- One year continuous data acquisition from 6 WMS (5 in Andhra Pradesh, 1 in Maharashtra) has been completed successfully.
- Continuously monitoring real time wind data receiving from 73 stations in 7 States, simultaneously.
- Interim report has been prepared and submitted to MNRE upto the month of May 2014.
- Monthly Data Analysis, Verification and preparation of interim reports are in progress.

Wind Resource Assessment Studies

- Dismantling of data logger for 1 site in Uttar Pradesh has been carried out.
- Interim report for 1 site in Uttar Pradesh has been prepared.
- Draft / Revised draft report for 1 site in Karnataka has been prepared & sent.
- Interim report for 6 sites in Kerala has been prepared.

Wind Turbine Testing

- Measurements for Power Curve Measurements of GVSL 700 kW wind turbine at Melamaruthappapuram Village, V. K. Pudur Taluk, Tirunelveli, Tamil Nadu of M/s. Garuda Vayu Shakti Limited have been completed in May 2014 and project has been closed.

- Measurements for Type testing of INOX 2000 kW wind turbine at Veraval (Bhadla), Jasdan Taluk, Rajkot District, Gujarat of M/s. INOX Wind Limited have been completed in July 2014 and the project has been closed.
- Measurements for Type Testing of XYRON 1000 kW wind turbine at Richadewda, Ratlam District, Madhya Pradesh of M/s. Xyron Technologies Limited are expected to be started shortly.
- Measurement for Type Testing of GVSL 1700 kW wind turbine at Kampaneari Pudhukudi Village, Tenkasi Taluka, Tirunelveli District, Tamil Nadu of M/s. Garuda Vayu Shakti Limited are ongoing at the site.
- Measurement for Power Curve Measurements of GWPL 2500 kW wind turbine at Vhaspeth, Sangli District, Maharashtra of M/s. Global Wind Power Limited have been completed in July 2014 and project has been closed.
- Inputs for Site Feasibility Studies for the proposed Prototype Testing of PW 100 (2.5 MW) Wind Turbine at Tadiyampatti Village in Kalgumalai Taluka, Thoothukudi District, Tamil Nadu of M/s. Power Wind Limited is in progress.

Wind Turbine Research Station

After successful completion of Operation & Maintenance works of Nine 200 kW MICON Wind Electric Generators for Un-interrupted operation during the Windy Season 2014, all the machines were kept in operation continuously and power generated is fed into the Grid during the windy season 2014.

Improved version of Gear Oil Cooler with provision of Air Ventilator and Increased Radiator Fins at the Nacelle itself for the cooler is being experimented in one of the 200 kW MICON WEG for better Gear Oil Temperature reduction during the windy season 2014. The study is under progress.

The following visits were coordinated and showcased the Small & Large Wind Turbine Testing, R&D and WRA facilities:

- 18 participants of 14th International Training Programme on “Wind Turbine Technology and Applications” visited on 11th September 2014.
- 36 students and 2 staffs from V.V. College of Engineering Thesayanvilai, Tirunelveli, Tamil Nadu visited on 2nd August 2014.
- 30 students and 3 staffs from Shree K. Ramakrishna College of Engineering, Samayapuram, Trichy, Tamil Nadu visited on 21st August 2014.



Standards and Certification

- An agreement has been signed with M/s. RRB Energy Limited to take up the project on renewal of Certificate of "Pawan Shakthi – 600 kW" wind turbine model under Category-II as per TAPS-2000 (amended). Carried out review / verification of documentation in connection with renewal of Certificate of "Pawan Shakthi – 600 kW" wind turbine model. Based on the review / verification, renewed Certificate has been issued to M/s. RRB Energy Ltd.



Issuing renewed Certificate to M/s. RRB Energy Limited

- Based on the request received and documentation submitted, wind turbine Type Certification services of M/s. TUV Rheinland Industries Services GmbH are recognized by NIWE.
- Review / verification of documentation provided by various wind turbine manufacturers for more than 55 wind turbine models in connection with Revised List of Models and Manufacturers of wind turbines (RLMM) - Main List have been completed.
- As part of RLMM process, Additional Director / Head, S&C and S&C Engineer carried out the verification of the manufacturing facility of a new wind turbine manufacturer.
- Organized the RLMM Committee meeting.
- RLMM Main List dated 11th September 2014 has been issued.
- Prepared consolidated list of wind turbine models and manufacturers as on September 2014 and hosted the same in NIWE website.
- Review / verification of documentation received for various wind turbine models from wind turbine

manufacturers in connection with installation of prototype wind turbines in India as per MNRE guidelines has been completed.

- Organized a Committee meeting on Prototype Wind Turbine Models.
- Grid synchronization of one prototype wind turbine of "EX-55 Version: RB XT-27, HH 60 m, 50 Hz" wind turbine model of M/s. Xyron Technologies Ltd. and one prototype wind turbine of "Garuda 1700.84, EU84.1800.3, HH 81.59 m, IEC IIIA" wind turbine model of M/s. Garuda Vaayu Shakthi Ltd. have been recommended.
- Additional Director / Head, S&C attended 5th meeting of Wind Turbine Sectional Committee, (ET 42) of BIS held at BIS, New Delhi on 11th August 2014.
- Comments have been prepared on draft Indian standards viz, Doc. No. ETD 42(6717) "Wind turbines- Part4: Design requirement for wind turbines gearbox" and Doc. No. ETD 42 (6718) "Wind turbines- Acoustic noise measurement techniques" and Additional Director / Head, S&C explained the comments in the 5th wind turbine sectional committee meeting (ET 42).
- Co-ordination works with Bureau of Indian Standards (BIS) and NIWE working Group in connection with standards related activities are ongoing.

Information, Training and Commercial Services

16th National Training Course

ITCS Unit had successfully organized the 16th National training course on "Wind Energy Technology" during 23rd - 25th July 2014 to address all aspects of Wind Power starting from Wind Resource Assessment to project implementation and operations & maintenance in a focused manner.

The course was attended by 41 participants from wind turbine manufacturers, developers, investors, consultants and academia from 18 States of the country. There are 36 male and 5 female candidates with diversified background participated in the course. The course was inaugurated by Dr. T. Ramasami, Former Secretary, Department of Science and Technology.

As part of every training course, a course material, compilation of the write-ups of all the presentation/lectures submitted by the lecturers specially prepared for the

particular content of the course for the benefit of the participants for a ready reference. The Course Material book was released by the Chief Guest.



Dr. T. Ramasami releasing the Course Material

In this training course, totally 25 topics were scheduled which were handled by 12 NIWE Scientists / Engineers and 10 external experts drawn from industry and academia. Shri. J.P. Singh, Director, MNRE was the Chief Guest for the Valedictory Function and has also distributed the Course Certificates.



Shri. J.P. Singh distributing the Course Certificates

14th International Training Course

ITCS Unit had successfully conducted the 14th international training programme on “Wind Turbine Technology and Applications” during 3rd to 30th September 2014 for ITEC / SCAAP countries sponsored by Ministry of External Affairs (MEA), Government of India and supported by Ministry of New and Renewable Energy (MNRE), Government of India.

The course was attended by 18 enthusiastic participants from 13 countries (Bhutan, Cuba, Ethiopia, India, Maldives, Mongolia, Myanmar, Nigeria, Peru, St. Lucia, Syria, Tanzania and Uganda) and inaugurated by Shri. D. Vaidyanathan, Chief General Manager, ITCOT.

During 28 days of training, 47 lecturers were delivered by 18 NIWE scientists, 5 manufacturers, 6 developers,

2 consultants and 4 premier academicians. Apart from theoretical lectures, practical classes had been conducted in Wind Resource Assessment Laboratory, Small & Large Wind Turbine Testing and R&D facilities. To provide hands on an experience, visits to large Wind Turbine Manufacturing Factory (M/s. Regen Power Tech, TADA, Chennai), Small Wind Turbine Manufacturing facilities (M/s. AUROVILLE, Pondichery), WTTS /WTRS (Kayathar) and Wind farms were also scheduled. Dr. C. Vaidyanathan, Former Vice Chancellor, Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya, Kancheepuram & Retired Chief Scientist, SERC was the Chief Guest for the Valedictory Function and distributed the Course Certificate to all participants.



Shri. D. Vaidyanathan delivering the Inaugural address



Dr. C. Vaidyanathan distributing the Course Certificate

Visitor to the NIWE

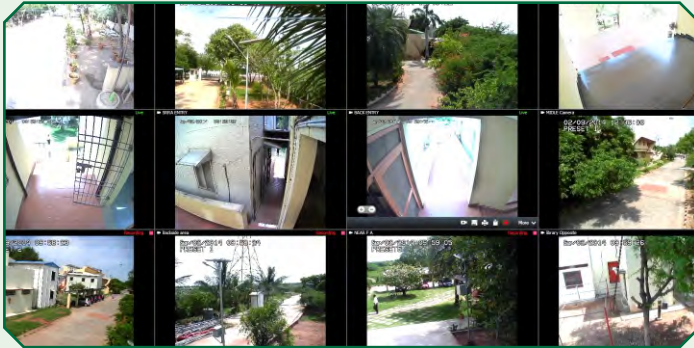
19 training participants (Polytechnic Teachers) of NITTR, Taramani has visited NIWE campus on 10th September 2014.

Engineering Services Division

- A campus surveillance system with CCTV cameras at NIWE has been put into operation on 22nd August 2014. The test trail is in process.
- Fixing of solar blinker new name board near NIWE main gate is under way.



- Expression of Interest (EoI) meeting with various vendors who had to create a board room set up video conferencing system has been completed on 13th August 2014. The preparation of technical specification is under process.



Surveillance System & CCTV Camera

Solar Radiation Resource Assessment

- Calibration of solar sensors of all SRRA stations in Tamil Nadu has been completed.
- Calibration of one Pyranometer & Pyrliometer on commercial terms has been completed.
- Mr. Prasun Kumar Das along with Mr. S. K. Singh, Director, NISE visited Leh & Kargil for feasibility study of Solar drying & cold storage.
- SRRA data of 17 stations were provided for 2 clients.
- SRRA officials visited Madhya Pradesh during 19th to 21st August 2014 for micro-siting of locations for relocation of Neemuch SRRA station. Also visited VIT, Vellore on 26th August 2014 for micro-siting location for the relocation of SRRA station.
- An EoI notice in connection with the training for the development of HR and capacity building under PPP mode uploaded in website for the attention of bidders.
- A proposal for 85 numbers of Low cost SRRA stations has been prepared for submission to Ministry.
- Dr. G. Giridhar officially inaugurated Kannur SRRA station by exchanging the MoU & NDA at Government Engineering College, Kannur on 31st July 2014.
- Dr. G. Giridhar officially inaugurated and inspected SRRA station at Mahabub Nagar on 27th August 2014.
- A budgetary offer for a DPR proposal for a project in Kerala was sent to NHPC.

Training Program Conducted by SRRA:

- Two days training programme on "Functioning and Maintenance of SRRA station" was organized at Central University of Jharkhand, Ranchi during 1st & 2nd July 2014 for the benefit of the SRRA station owners of Jharkhand, Chhattisgarh, Odisha, West Bengal and Bihar.
- Two days training programme on "Functioning and Maintenance of SRRA station" was organized at Tezpur University, Tezpur during 3rd & 4th July 2014 for the benefit of the SRRA station owners of all North Eastern states.

New Infrastructure created/proposed

- A calibration laboratory is being established at Prathyusha Institute of Technology & Management, Thiruvallur for calibration of solar sensors.

Finance & Administration

New Infrastructure created

Gym for both men and women were put into use on 24th July 2014 and 28th August 2014 respectively.

Invited lecture delivered / meeting attended by NIWE Scientists in external forums

Dr. S. Gomathinayagam, Director General

- Renewable World 2014 convention Keynote Session II- Wind power CEO's conclave with a theme "Fast Track out of Box Thinking to accelerate wind power development in the Country at Delhi on 3rd July 2014.
- Follow up Meeting to review the status of action taken and recommend suggestions made during with Minister at MNRE, New Delhi on 7th July 2014.
- Review meeting on Discussions on development of business model for setting up of first pilot demonstration offshore wind power project at MNRE, New Delhi on 8th July 2014.
- Chaired the Committee Meeting on installation of prototype wind turbine models in India on 10th July 2014
- Certification proposal discussion with Mr. M.P. Ramesh (Former ED) & Additional Director & Head, S&C on 11th July 2014.
- Technical Committee Meeting of SRRA at MNRE, New Delhi on 14th July 2014.
- 33rd Governing Council Meeting at MNRE, New Delhi on 15th July 2014.

- Discussion on setting up of first pilot demonstration offshore wind power project in the Country-Meeting at MNRE, New Delhi on 16th July 2014.
- Meeting on Green Power-2014 at ITC Grand Chola, Chennai on 17th July 2014.
- Workshop on Green Building at NIWE on 18th July 2014.
- Attended Session in “Opportunities and Challenges in WE Sector” at ITC Grand Chola, Chennai on 18th July 2014.
- Inauguration of Men Gym at NIWE on 24th July 2014.
- SWT-Empanelment meeting at NIWE on 25th July 2014.
- 4th Scientific Committee Meeting of NAL at Bangalore on 28th July 2014.
- Purchase Committee Meeting for Land, Kayathar on 31st July 2014.
- Chaired Wind Energy Session on R&D conclave Meet at Vigyan Bhavan, New Delhi on 5th August 2014.
- Review Meeting for finalisation of MoU to be signed for Demonstration Offshore Wind power Project at MNRE, New Delhi on 6th August 2014.
- Meeting of the followup of actions committee on Wind Power at MNRE, New Delhi during 7th & 8th August 2014.
- Chaired ET-42 Committee at BIS, New Delhi on 11th August 2014.
- WRA Meeting at MNRE, New Delhi on 12th August 2014.
- NIWE Finance Committee Meeting at MNRE, New Delhi on 13th August 2014.
- Meeting to discuss action for registration of Association of State Nodal Agencies for Renewable Energy at MNRE, New Delhi on 20th August 2014.
- 5th World Renewable Energy Technology Congress & Expo 2014 on 21st August 2014.
- Joint Secretary (WE) & Director General Chaired Session VI of 5th World Renewable Energy on “Wind-New Technology & Offshore Wind Farming” on 22nd August 2014.
- Presentation on “to describe on the methodology and next steps” for the Revised Wind Power Potential in India meeting at MNRE, New Delhi on 22nd August 2014.
- Inauguration of 14th International Training Programme at NIWE on 4th September 2014.
- Chaired the RLMM Meeting on 5th September 2014.
- FOWIND Stakeholders Sensitization workshop – ED Panalist for “Offshore Wind Development-Way Forward for India and TN” on 11th September 2014.
- 34th Governing Council and 17th AGM of NIWE at MNRE, New Delhi on 12th September 2014.
- First meeting of the Standing Committee on Energy Storage and Hybrid solutions at MNRE, New Delhi 15th September 2014.
- Valedictory Function of Hindi Fortnight and Prize Distribution at NIWE on 25th September 2014.
- Valedictory Function of 14th International Training Programme at NIWE on 30th September 2014.

Rajesh Katyal, Deputy Director General & Head, R&D

- “Small Wind Turbine and Hybrid system” in Workshop on Green Building organized by M/s. H. B. Management & Engineering Consultants Pvt. Ltd., Chennai, at NIWE on 18th July 2014.
- Land Procurement Committee meeting at WTRS, Kayathar on 31st July 2014.
- Chaired a conference on “Energy – Economy – Environment” at Madras Chamber of Commerce and Industry at Hotel Le Meridian, Chennai on 5th September 2014.

NATIONAL TRAINING

17th National Training Course on “WIND ENERGY TECHNOLOGY”
during 18th - 20th March 2015

Detailed information is made available in NIWE websites

INTERNATIONAL TRAINING

12th International Training Programme on
“WIND TURBINE TECHNOLOGY AND APPLICATIONS”
Specially for African Countries
during 19th November - 12th December 2014

Detailed information is made available in NIWE websites

**Deepa Kurup**, Deputy Director, R&D

- Delivered a lecture on "Wind and Solar Energy - Potential & Challenges" at one day seminar on "Exploring the current issues and challenges in sustainable energy" at IIT, Madras on 5th June 2014.

K. Boopathi, Additional Director & Head, WRA

- Meeting in connection with establishing Wind Monitoring Stations in Assam for M/s. Oil India Ltd., Noida at Guwahati, Assam on 28th July 2014.
- Purchase Committee meeting with regard to procurement of land at Kayathar for Testing / R&D / WRA and other related activities at Kayathar on 31st July 2014.
- Delivered a lecture on Wind Resource Assessment during "One day Workshop on New Renewable Energy Sources" – WONRES 2014 at Aarupadai Veedu Institute of Technology, Paiyanoor, Chennai on 20th August 2014.
- Meeting on Repowering and Promotion of Small Wind Mills at Coimbatore on 10th September 2014.

M. Joel Franklin Asaria, Additional Director, WRA

- Meeting in connection with establishing Wind Monitoring Stations in Assam for M/s. Oil India Ltd., Noida at Guwahati, Assam on 28th July 2014.

G. Arivukkodi, Assistant Engineer, WRA

- Presented a Poster on "Studies on noise propagation of Wind Turbines from a Wind Farm in India" in the International Conference on Advancements in Materials, Health & Safety towards sustainable Energy & Environment organized by IJAA Conference (MHS-2014), Chennai during 7th & 8th August 2014.

Mohammed Hussain, Director & Head, WTRS

- Delivered a lecture on "Over view of Testing / R&D / WRA facilities at WTRS / WTTS, Kayathar during visit of 14th International Training Programme participants to WTRS, Kayathar on 11th September 2014.

S&C Engineer

- Delivered lecture on "Application of Electronic components in wind turbine" as part of TTT hour held at NIWE, Chennai.

S.A. Mathew, Additional Director & Head, WTT

- Guest Lecture on "Wind Energy Systems" to the students of Department of Electrical & Electronics Engineering at Valliammai Engineering College, Chennai on 27th August 2014.
- Meeting of Wind Turbines Sectional Committee, ET 42 at Bureau of Indian Standards (BIS), New Delhi on 11th August 2014.

P. Kanagavel, Additional Director & Head, ITCS

- Delivered a lecture on "Renewable Energy & Impacts of Climate Change" in Peniel Matriculation School in Pallikaranai on 22nd August 2014.
- Inaugurated as Chief Guest & delivered lecture on "Wind Turbine Technology and Applications" in the three days National level faculty development programme on "Research Challenges in Smart Grid Technology" at Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai on 18th September 2014.

Dr. G. Giridhar, Director & Head, SRRA

- Meeting on solar energy potential under the chairmanship of Joint Secretary, MNRE at MNRE, New Delhi on 3rd July 2014.
- Technical review meeting on SRRA Phase I & II program at MNRE, New Delhi on 15th July 2014.
- Technical Committee Meeting on "Grid Integration of Solar PV Power Plant at NIWE, Chennai on 19th August 2014.
- Project Advisory Committee Meeting held at New Delhi on 21st August 2014.
- Chief Guest for the 4th National Level Technical Conference (EPSCCON'14) at Veltech Engineering College, Avadi, Chennai on 26th August, 2014.
- Inauguration and inspection of SRRA station at Mahabunagar on 27th August 2014.
- Delivered a lecture on Solar Radiation Assessment in India Activities of NIWE as a speaker of Training program "IREDA – Promotion of New Renewable Energy Projects"- Components 2: Training" in association with the Adelphi Consult GmbH to train IREDA officials on solar & wind sectors at New Delhi on 19th September 2014.

R. Sasi Kumar, Consultant, SRRA

- Presentation on Solar Resource Assessment Study in India in the two days training program on "Functioning and Maintenance of SRRA stations" at Central University of Jharkhand, Ranchi during 1st & 2nd July 2014.
- Presentation on Solar Data collection in India, in a seminar on Recent Trends in Renewable Energy Sources at College of Engineering and Management, Alappuzha on 30th July 2014.
- Presentation on Solar Data collection in India, in a Seminar on Importance of Solar Radiation Data for Application and Research held at Government College of Engineering, Kannur on 31st July 2014.

Prasun Kumar Das, Assistant Director (Technical) Contract

- Presentation on Solar Resource Assessment Study in India in the two days training program on "Functioning and Maintenance of SRRA stations" held at Tezpur University, Napaam, Tezpur during 3rd & 4th July 2014.
- Delivered a lecture on "Solar Tech Indian Conference 2014" at New Delhi during 21st to 23rd 2014.

R. Karthik, Assistant Director (Technical) Contract

- Delivered a lecture on "Radiation (DNI) and Satellite Data" in CSP conference at New Delhi during 10th & 11th July 2014.
- Delivered a lecture on "Solar Energy" for one day workshop on New & Renewable Energy Resources at Aarupadai Veedu Institute of Technology, Chennai on 21st August 2014.

D. Lakshmanan, Director, A&F

- Presentation on "Service Book, Leave Account, Travelling Allowance, Pay Fixation, GPF, Pension and NPS" in the "Skill Development Programme for Assistants and Stenographers" organized by CSIR-Human Resource Development Centre (HRDC), Ghaziabad at Structural Engineering Research Centre, Chennai and Central Leather Research Institute, Chennai on 18th & 19th August 2014.

Visits Abroad

K. Boopathi, Additional Director & Head, **A.G.Rangaraj**, Assistant Director (Technical), **J. Bastin**, Assistant Director, (Technical) & **M.C. Lavanya**, Assistant Director (Technical) of WRA Unit attended Special Training on Wind Power Forecasting offered by M/s.Vortex Factoria at Barcelona, Spain during 10th to 12th July 2014.

P. Kanagavel, Additional Director & Head of ITCS Unit attended and delivered lecture on "Environmental impact of Wind Energy: Indian Perspectives" in BIT's 4th New Energy Forum - 2014 at Qingdao, China during 21st to 23rd September 2012.

Publications

- **Dr. S. Gomathinayagam**, Director General, NIWE - Cover Story - Special Focus : National Institutions of Renewable Energy.
- **Rajesh Katyal**, Deputy Director General & Head, R&D - An article on "Wind-Solar-Hybrid System" in the IWTMA newsletter "WINDPRO".
- **Dr.G.Giridhar, Prasun Kumar Das and Dr.S. Gomathinayagam** - An article entitled "Solar Radiation Resource Assessment project in India: A new initiative" published in Akshay Urja, a bi-monthly Newsletter of MNRE.

Awards & Achievements



Dr.S.Gomathinayagam has been awarded "Distinguished Alumnus Award" for excellence in Scientific/Industrial Research in the Golden Jubilee Celebrations of the National Institute of Technology (NIT), Tiruchirappalli in July, 2014 in presence of Hon'ble President of India, Hon'ble Governor of Tamil Nadu and Hon'ble State Education Minister of Tamil Nadu.

The following NIWE staff delivered lecture(s) in the 16th National Training Course on “Wind Energy Technology” held during 23rd to 25th July 2014 and 14th International Training Programme on “Wind Turbine Technology & Applications” held during 3rd to 30th September 2014

S.No.	Topic	Speaker
1	• Introduction and Status of Wind Energy Technology	Dr. S. Gomathinayagam
	• Wind Turbine Tower	
2	• Role of NIWE in Wind Energy Development	Shri. P. Kanagavel
	• Wind Energy Development in India	
	• Environmental Aspects of Wind Turbine Technology	
3	• Overview of Wind Turbine Components	Shri. J. C. David Solomon
	• Drive Train Concepts	
4	• Wind Turbine Gear Box	Shri. N. Raj Kumar
5	• Wind Turbine Generators	Shri. M. Anvar Ali
6	• Control and Protection System in Wind Turbine	Shri. S. Arulselvan
7	• Wind Turbine Foundation	Shri. Rajesh Katyal
	• Small Wind Turbine Testing and Hybrid Systems	
8	• Type Certification of wind turbine and overview of Design Requirements as per IEC 61400 - 1	Shri. A. Senthilkumar
9	• Wind Turbine Testing & Measurement Techniques	Shri. S. A. Mathew
	• Power Curve Measurements	
10	• Instrumentation for Wind Turbine Testing	Shri. M. Saravanan
11	• Safety and Function Testing	Shri. Bhukya Ram Das
12	• Indian Government Policies and Schemes	Shri. Mohammed Hussain
13	• Grid Integration of Wind Turbine	Smt. Deepa Kurup
14	• Wind Resource Assessment and Techniques	Shri. K. Boopathi
	• Wind Measurements by Remote Sensing Instruments	
	• Forecasting of Wind Energy Production	
15	• Guidelines for Wind Measurements	Shri. J. Bastin
16	• Wind Measurement and Instrumentation	Shri. B. Krishnan
17	• Wind Data Measurements and Analysis	Smt. G. Arivukkodi
18	• Offshore Wind Energy: An Overview	Shri. Joel Franklin Asaria
19	• Solar Radiation Resource Assessment	Dr. G. Giridhar

INTERNATIONAL TRAINING

**15th International Training Programme on
“WIND TURBINE TECHNOLOGY AND APPLICATIONS”
during 4th February - 3rd March 2015**

Detailed information is made available in NIWE websites

Training / Conferences / Seminars attended by NIWE Scientists

R&D Unit Staff

- Attended Small Wind Turbine and Hybrid Systems Meeting and provided the inputs on the status of Small Wind Energy and Hybrid Systems” at MNRE, New Delhi on 8th August 2014
- Attended 2nd R&D Conclave on New and Renewable Energy and prepared the brief of the project highlights presented by the proponents and submitted to MNRE organized by MNRE held at Vigyan Bhavan, New Delhi on 5th August 2014.
- Advisory Group Meeting at Ministry of Power, New Delhi on 19th July 2014.
- Workshop on Green Building organized by M/s H.B Management & Engineering Consultants Pvt. Ltd., Chennai held at NIWE office on 18th July 2014.

M.Joel Franklin Asaria, Additional Director, WRA

- Attended “Green Power Conference” organized by CII, Chennai during 17th & 18th July 2014.

WRA Team

- Training on Sensors & Instruments for WRA Project Assistants has been conducted at NIWE during 4th & 5th September 2014.

A.Senthil Kumar, Additional Director & Head, S&C

- Workshop on Addressing Challenges to Renewable (Wind) Energy manufacturing Industry in India: Horizon 2032 at WISE, Pune on 8th July 2014.
- Conference for Green Power International Conference & exposition on Renewable energy 2014 at Chennai during 17th & 18th July 2014.

S&C Engineers

- Workshop on “Changing paradigms in Energy Efficient Solar / Green Buildings” sponsored by Ministry of New

and Renewable Energy and jointly organized by SRRA & M/s. H B Management & Engineering Consultants (p) Ltd. at NIWE, Chennai on 18th July 2014.

- “MSC Software India User Conference 2014” at ITC Grand Chola, Chennai on 12th September 2014.

P. Kanagavel, Additional Director & Head, ITCS

- One day workshop on Developing Strategy for Education & Vocational Training for the Renewable Energy Sector in India on 22nd August, 2014 at New Delhi.

Reservation Policy

Finance and Administration organized a training on Reservation Policy at NIWE, Chennai during 12th & 13th September 2014 through Institute of Public Administration, Bangalore. All NIWE staff & staff from neighbouring Government institutions attended the training.

Networking Cyber Crime Training

Engineering and Services Division organized a training on Networking Cyber Crime at NIWE, Chennai during 8th & 9th August, 2014 through Mr. Sachin Dedhia, Consultant, Skynet Secure. All NIWE staff & staff from neighbouring Government institutions attended the training.

Right to Information Act, 2005 Training

Finance and Administration organized a training on Right to Information Act - 2005 at NIWE, Chennai on 4th August, 2014 through Mr. K. Govindarajulu, Joint Director, Institute of Secretariat Training & Management. All NIWE staff and staff from neighbouring Government institutions attended the training.

SARAL TDS training

- R. Girirajan, AAO, B. Muthulakshmi, ES & J. Rekha, JEA organized by Reylon Softech Limited on 19th July 2014.

PROMOTION

- **Shri. Rajesh Katyal**, Scientist 'E' has been promoted to Scientist 'F' with effect from 1st January 2014.
- **Shri. M. Selvakumar** promoted as Record Keeper on 14th August 2014 from Daftary.

**“CENTRE FOR WIND ENERGY TECHNOLOGY”
IS NOW RENAMED AS
NATIONAL INSTITUTE OF WIND ENERGY**

QUALITY ASSURANCE & QUALITY CONTROL FOR WIND TURBINE

K. Muralidharan, Vice President (Quality), Leitner Shriram Manufacturing Ltd., Chennai E-mail : muralidharan@lsml.in

What is Quality?

Quality means the totality of features and characteristics of a product or service that bears its ability to satisfy, the stated or implied needs. (Refer ISO 8402-1986 standard)

Further Quality is defined as fitness for purpose and ability of the material or product / component to perform satisfactorily in an application for which it is intended by the user.

Quality means many things to many people,

- + To a sales man it's a magic word to be used as many times as possible in his sales presentation.
- + To a Company's Managing Director it is a reputation that must be achieved and once achieved, maintained.
- + To an Engineer it is doing a job that he knows the way it should be done, without compromise.
- + To a customer, quality is that property of a product that creates a desire to use or own.

People have found many ways to define what quality is. Some of the most popular definitions for quality is listed below which contains a key element of what quality means to users of products and services.

- a) A degree of excellence
- b) Conformance to requirements
- c) Totality of characteristics which act to satisfy a need
- d) Fitness for use
- e) Fitness for purpose
- f) Freedom from defects
- g) Delighting customers
- h) Means Respect
- i) Means Leadership
- j) Is vital for existence
- k) Is not a hobby – it's something special to have
- l) Is no accident – it must be planned
- m) Is zero defect – not acceptable level

Reliability comes from achieving quality standards. This means the level of quality produces its equivalent reliability.

Definitions of Quality

- ✧ Conformance to Specifications
- ✧ The degree to which a product or service meets
- ✧ Uniformity around a customer-defined target
- ✧ Exceeding customer expectations

The customer is the most important part of the process.

Quality Assurance refers to the processes and procedures that systematically monitor different aspects of a service, process or facility to detect, correct and ensure that quality standards are

being met also Known As: Q.A.

Quality assurance helps us to eliminate defective products and increase Customer Satisfaction. The term also assuring of the desired quality, reliability, service and other aspects of the manufactured product through scientific techniques at design, manufacturing stage and on observation of the performance in actual field.

QA frameworks include

- (1) Determination of adequate technical requirement of inputs and outputs.
- (2) Certification and rating of suppliers.
- (3) Testing of procured material for its conformance to established quality, performance, safety and reliability standards.
- (4) Proper receipt, storage, and issue of material.
- (5) Audit of the Process quality.
- (6) Evaluation of the process to establish required corrective response.
- (7) Audit of the final output for conformance to
 - (a) Technical.
 - (b) Reliability.
 - (c) Maintainability.
 - (d) Performance requirements.

◆ **Quality System:** The Various procedures developed for maintaining the quality requirement throughout the manufacturing process of the product with respect to the design criteria.

◆ **Quality Assurance Plan:** Various Checking procedures that are developed with respect to the design / drawing in order to get required quality of the components / products at different process levels.

◆ **Quality Control:** Quality Control is a total effort required after system is put in place to detect deviations from the norm and return the process to that norm.

◆ Quality Control is an aspect of the Quality Assurance Process that consists of activities employed in detection and measurement of the variability in the characteristics of output attributable to the production system, and includes corrective response

For achieving Quality control of the product, an Inspection is a must!!

Objectives of Quality Control:

- ◆ To achieve lower scrap, less rework, less sorting thus reducing company's cost.
- ◆ To produce optimum quality at minimum price
- ◆ To achieve interchangeability

- ◆ To improve the productivity
- ◆ To ensure customer satisfaction

Inspection is the process of examining the goods to ascertain whether they conform or deviate from the standards of quality that have been specified for them. Inspection is a sort of postmortem performed to give a verdict.

Inspection is one time activity while Quality control is a continuous process.

Inspection is one time activity while Quality control is a continuous process.

Why Inspection?

- ◆ To prevent further process of materials spoiled in earlier process or operation.
- ◆ To locate manufacturing process, that are producing or tending to produce defective work because of mechanical or human failure as a preliminary to correct the cause.
- ◆ To prevent delivery of defective products to customers.
- ◆ To prevent shipment of goods, those do not agree with specifications.

Types of Inspection:

- ◆ Sorting or Acceptance Inspection: For the purpose of classifying products as good or bad and is used to decide on the disposition of defective units by rework, salvage of scrap.
- ◆ Inspection by attributes: Product that do or not possess a specific characteristic or attribute
- ◆ Inspection by variable: Inspection with a graduated measuring instrument to determine the actual size of work within the level of accuracy inherent in the measuring tool.
- ◆ One hundred percent inspection: Inspection where no defective units are permitted, 100% inspection of product is necessary.
- ◆ Sampling Inspection: Inspection performed on a random sample, drawn from a lot of product, where sample is considered to be representative of the entire lot. The lot is accepted after inspection or some cases rejected based on the result of inspection.
- ◆ First piece inspection: Inspection carried out on a trial piece product evolves from a semi automatic or automatic machine
- ◆ Pilot piece inspection: When operations on more than one machine are required to complete a component a trial piece is run through all machines. The pilot piece is subjected to inspection before the production line is released for continuous run.
- ◆ Working Inspection: This is the extended form of sampling inspection carried out periodically to find out any defect cost I the product by usage of defective tool or altered adjustment in the machine.
- ◆ Stage wise inspection: (In process Inspection) The work is inspected before and / or after critical or expensive operations so that an additional effort is made to prevent manufacturing of defective units.
- ◆ Material Analysis Inspection: Materials testing that are carried out to assess the fundamental mechanical properties, surface

defects, chemical composition of the raw materials that are used for various processes during manufacturing of the product.

- ◆ Performance Inspection: Component that can be inspected only on operational condition and filled into its relevant line of function and inspected
- ◆ Endurance Inspection: Carried out in Automobile and other allied machinery inspections. Components are taken from assembly lines, are operated for a specified time, until failure occurs, their by eliminate using of defective components, that are not able to withstand the required specification.

Acceptable Quality Level (AQL)

The AQL is a designated value of percent nonconforming (or nonconformities per 100 units) that will be accepted most of the time by the sampling scheme to be used. The sampling plans provided are so arranged that the probability of acceptance at the designated AQL value depends upon the sample size for a given AQL.

The AQL is a parameter or a sampling scheme and should not be confused with process average which describes the operating level of the manufacturing process. It is expected that the process average will be less than or equal to AQL to avoid excessive rejection under this system.

Submission of Product for Sampling: Ref. Table I – Sample size code of IS 2500 (Part I) : 1992 or BS6001-4:2005/ISO2859-5:2005

Formation of Lots

- ◆ Presentation of Lots
- ◆ Inspection Level.
- ◆ Normal, Tightened and Reduced Inspection
- ◆ Start Inspection
- ◆ Continuation of inspection
- ◆ Switching Rules and procedures (Ref. Figure)
 - ◆ Normal to Tighten
 - ◆ Tightened to Normal
 - ◆ Normal to Reduced
 - ◆ Reduced to Normal
- ◆ Discontinuation of Inspection

Sampling Plan

- ◆ A statement of the sampling procedure and the rate of making inferences about the lot.
- ◆ Inspection Level (Ref. IS 2500 (Part I) – 1992) or BS6001-4:2005/ISO2859-5:2005
- ◆ There are three different inspection levels (Level I, II and III) provided in Indian Standard Sampling procedures. Unless specified, level II shall be used. Level I may be used when less discrimination is needed or Level III when greater discrimination is required. Four additional special levels, S-1, S-2, S-3, and S-4, are given and may be used where relatively small sample size are necessary and large sampling risks can or shall be tolerated.

Acceptance Number - Ac:

The maximum allowable number of defectives (or count of defects) in the sample(s) for Rejection of the lot.

- ◆ Rejection Number - Re:
- ◆ The minimum number of defectives in the samples for rejection of the lot.
- ◆ Single Sampling plan
- ◆ A type of sampling plan in which a decision to accept or reject a lot is reached after one sample from the lot has been inspected.

CALIBRATION

Calibration is often regarded as the process of adjusting the output or indication on a measurement instrument to agree with value of the applied standard, within Specified accuracy.

Purpose of a calibration?

There are three main reasons for having instruments calibrated:

To ensure readings from an instrument are consistent with other measurements.

To determine the accuracy of the instrument readings.

To establish the reliability of the instrument i.e. that it can be trusted.

Traceability: relating your measurements to others

Uncertainty: how accurate are your measurements?

Reliability: can I trust the instrument?

Achieving Traceability in your measurements

Adjustment: what a calibration is not

What a calibration certificate contains

Your calibration certificate must contain certain information if it is to fulfil its purpose of supporting traceable measurements. This information, which is listed in ISO Guide 25, can be divided into several categories)

it establishes the identity and credibility of the calibrating laboratory;

it uniquely identifies the instrument and its owner;

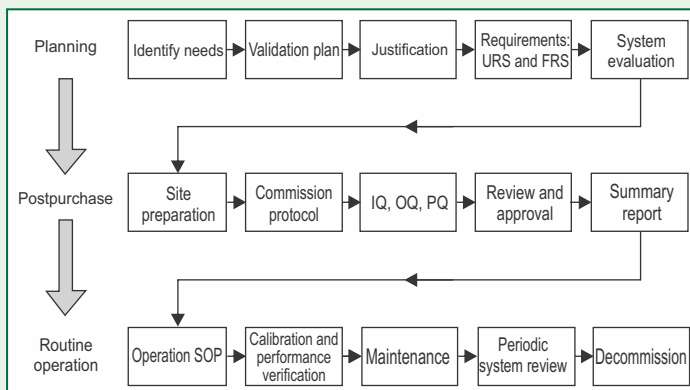
it identifies the measurements made; and

it is an unambiguous statement of the results, including an uncertainty statement.

In some cases the information contained in your certificate might seem obvious but ISO Guide 25 grew out of the experience that stating the obvious is the only reliable policy.

Procedure**1. Choosing the Right Instrument**

- ◆ Start with Accurate Monitoring Instruments: No matter how sophisticated the calibration procedure is, it cannot compensate for the inherent performance limits of the instruments it calibrates.
- ◆ No amount of calibration or re-calibration will improve the accuracy of an instrument as a measuring device.

2. Instrument Procurement and Life Cycle**3. Why is Qualification & Calibration Necessary?**

- ◆ Qualification
- ◆ It basically proves that the equipment works correctly and actually leads to accurate and reliable results
- ◆ Calibration
 - + Ensures that on an on-going basis that the equipment is performing properly
 - + Often times, these tests are sub-set of the qualification tests performed

4. Responsibility

- ◆ "Users are ultimately responsible for instrument operations and data quality. The user's group encompasses analysts, their supervisors, instrument specialists and organization management."
- ◆ "Users should also be responsible for qualifying/calibrating their instruments, because their training and expertise in the use of instruments make them the best-qualified groups to design the instrument test(s) and specification(s) necessary for successful AIQ."

5. Classification of instruments

- ◆ Classify instruments into Group A, B and C
- ◆ Group A
 - + No measurement capability or requires calibration
 - + Mixers, centrifuges, etc
- ◆ Group B
 - + Providing measurements or controlling physical parameters such as temperature, pressure, etc
 - + Balance, thermometer, pH meter
- ◆ Group C
 - + Sophisticated instruments, etc.

6. Qualification - Four Qs

- ◆ Design Qualification (DQ)
- ◆ Installation Qualification (IQ)
- ◆ Operational Qualification (OQ)
- ◆ Performance Qualification (PQ)

7. Design Qualification

- ◆ Documented collection of activities that defines functional and operational specifications/requirements

- ◆ Criteria for selecting the vendor
- ◆ Details the conscious decisions of the selection of the supplier

8. Calibration Frequency

- ◆ manufacturer's recommendations
- ◆ relevant procedures – sensitive?
- ◆ instrument performance history
- ◆ overall impact of non-compliances in the calibration process and previous experience of the laboratory technical staff.

9. Calibration Specification

- ◆ Instrument calibration tolerance limits should be established so problems are identified and corrected in a timely manner
- ◆ When assigning tolerances, considerations given to:
 - + Capability of the instrument being calibrated (what the manufacturer claims the instrument can achieve).
 - + Parameters at which the instrument operates (ex: if testing accuracy of + 0.5% is required, the instrument calibration tolerances should be <0.5%)
 - + Work environment - environmental conditions can affect the performance of the instrumentation

10. Success of Calibration

Success of calibration depends on the following :

- ◆ Consistency of results obtained
 - ◆ Recognition and mitigation of outlier/potential outliers
 - ◆ Scientifically designed calibration frequency
- ### 11. Calibration – Quality System
- ◆ Specific Directions
 - ◆ Schedules
 - ◆ Limits of accuracy & precision
 - ◆ Remedial Actions
 - ◆ Systems to prevent usage of instruments failing calibration

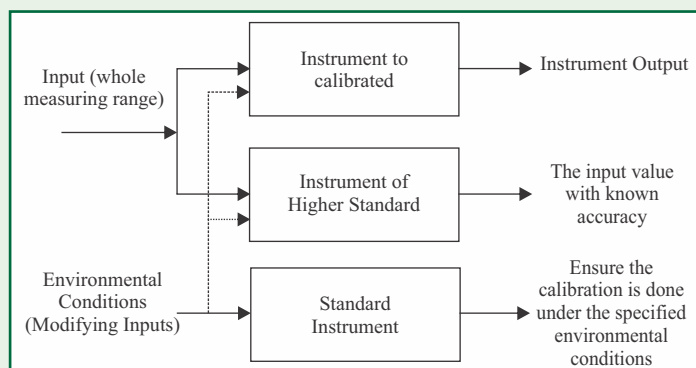
12. Tracking Instruments for Calibration Status

- ◆ Each instrument given a unique identifier
- ◆ Instrumentation details associated with this number must be documented and available (e.g. serial number, model number, location, etc.)
- ◆ Each instrument should be labeled with the unique identifier
- ◆ Calibration status of each instrument, the date of calibration, the next calibration date and the identification of person performing calibration should be readily available
- ◆ Appropriate systems to document calibration status include calibration logs and calibration stickers

13. Calibration process

The purpose of calibration is to ensure that the measuring accuracy is known over the whole measurement range under specified environmental conditions for calibration.

- ◆ Written calibration procedures that use traceable calibration standards or calibration equipment.
- ◆ Qualified individuals (having the appropriate education, training, background and experience) responsible for calibrating & maintaining instrumentation



- ◆ Second person check of all calibration tests
- ◆ Qualified individuals responsible for monitoring the calibration
- ◆ Ensure the calibration program and procedures are reviewed and approved by Quality
- ◆ Each calibration & maintenance procedure should include the following:
 - + Identification of department responsible to perform the calibration or maintenance
 - + Step-by-step calibration instructions, reference to appropriate calibration procedures or instrument manuals
 - + Methods for preventive maintenance or reference to appropriate instrumentation manuals
 - + Calibration equipment used in the calibration are valid (e.g. spectroscopy filters, voltmeters, digital thermometers, etc)
 - + Calibration parameter and tolerance (+)

14. Out-of-Calibration Procedure

- ◆ If calibration is not complete within time.
- ◆ Results from the calibration do not meet set criteria.

Identification of Causes

- ◆ Training of analyst for calibration procedures.
- ◆ Glassware/Standards – Cleanliness, Validity etc.
- ◆ History of malfunction/breakdown and maintenance.
- ◆ Review of previous calibration report.

15. Records for Calibration

Your tool calibration and control records should cover these items:

- ◆ Tool Number
- ◆ Tool Name
- ◆ MFG Name
- ◆ Tool Location.
- ◆ Calibration procedure callout
- ◆ Calibration interval.
- ◆ Transfer standard name used to calibrate the instrument
- ◆ Transfer standard tool number
- ◆ Date of calibration
- ◆ Next due date of calibration
- ◆ Calibration record number



- ◆ Calibration requirements
- ◆ Calibration data
- ◆ Employee's name or signature
- ◆ Temperature
- ◆ Humidity
- ◆ Accept/Reject results

NOTE:

- + All calibration records must be retained per document retention procedures
- + Should include "as found" measurements, results of adjustments ("as left") and appropriate review & approval of all results
- + Tolerance or limit for each calibration point
- + Identification of standard or test instrument used
- + Identification of persons performing the work and checking the results with dates

16. After Calibration

- ◆ Review must ensure the approved activities have been completed and all results have passed the established acceptance criteria
- ◆ Actions to be taken if instrumentation cannot be calibrated (e.g. contact appropriate service people, label and remove from service)
- ◆ A step to record all calibration & maintenance activities
- ◆ Periodic review of historic calibration & maintenance data to evaluate appropriateness of established frequencies

17. Calibration of Instrument System

- ◆ Measurement of Accuracy
- ◆ Establishment the relation of an instrument's accuracy to the international standard

Calibration process must be managed and executed in a professional

- ◆ A particular place for all calibration operations to take place and keeping all instruments for calibration
- ◆ A separate room is preferred because (1) better environmental control and (2) better protection against unauthorized handling or use of the calibration instruments.
- ◆ The performance of all calibration operations is assigned as the clear responsibility of just one person.
- ◆ Calibration procedures, used for quality control functions, are controlled by the international standard ISO 9000. It requires that all persons using calibration equipment be adequately trained.

18. Documentation of Calibration

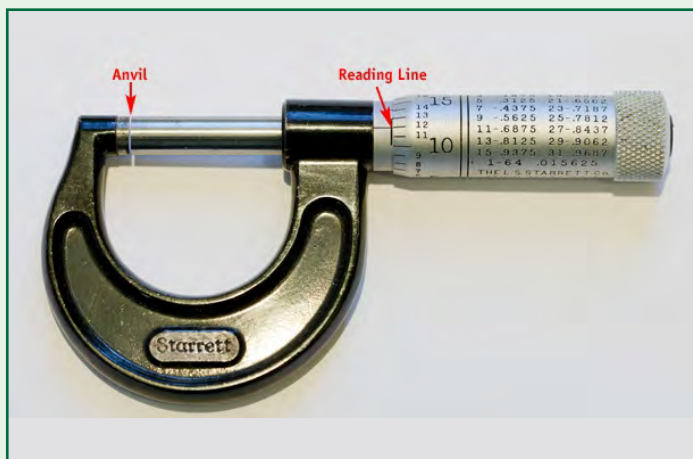
An essential element in the operation of calibration is the provision of full documentation that consists of the following:

- ◆ Measurement requirements (such as environmental conditions)
- ◆ Instruments used
- ◆ Calibration system and procedures operated
- ◆ Calibration record

- ◆ Traceability of the calibration system back to national reference standards must be defined and supported by calibration certificates.

- ◆ Training programmes

The above-mentioned are also important to the maintenance of measurement system and form a necessary part of the quality manual.

What instruments needs calibration?

- ◆ Working, Primary and Transfer Standards
- ◆ Any tool that is used to measure product quality
- ◆ Any measurement equipment that is used to monitor and measure the process, process inputs or process outputs

We recommend reviewing all process equipment that have continuous analog or digital output. If there are no other calibrated instruments that can be used to monitor that output, then that process equipment also needs to be calibrated.

For example, an oven has a digital readout. Lets say the oven needs to be set at 125 C. During oven operation the digital readout is 125 C, but how can you be sure this is correct? If you have a calibrated thermometer then this can be used assure the oven is actually 125 C. If you do not have a calibrated thermometer then the oven's digital readout needs to be calibrated.

Recommended Calibration Labels**Instrument Calibration Label**

- ◆ Date of Calibration
- ◆ Calibration record number
- ◆ Calibration Due date
- ◆ Calibration Employee Signature.

Calibrate Prior to Use label. Used for equipment that must be checked for accuracy prior to use.

Do Not Use label on equipment that is out of calibration and not repaired.

CALIBRATION

I.D. No. _____
 By _____ Date _____
 Due _____

Calibration Interval

Base the calibration interval on the instrument's stability, purpose, degree of usage, environment, past history of equivalent instruments and manufacturer's recommendations. You can use the below as a guideline:

Used Frequency	Calibration Interval
Daily	3 months
Every other Day	6 months
Once weekly	12 months
Once Monthly	24 months
Once Yearly	36 months

Quality Assurance vs. Quality Control

Quality Assurance is process oriented and focuses on defect prevention, while quality control is product oriented and focuses on defect identification

Quality Assurance

An overall management plan to guarantee the integrity of data (the "system")

Quality Control

A series of analytical measurements used to assess the quality of the analytical data (The "tools")

Comparison chart

	Quality Assurance	Quality Control
Definition	QA is a set of activities for ensuring quality in the processes by which products are developed.	QC is a set of activities for ensuring quality in products. The activities focus on identifying defects in the actual products produced.
Focus on	QA aims to prevent defects with a focus on the process used to make the product. It is a proactive quality process.	QC aims to identify (and correct) defects in the finished product. Quality control, therefore, is a reactive process.
Goal	The goal of QA is to improve development and test processes so that defects do not arise when the product is being developed.	The goal of QC is to identify defects after a product is developed and before it's released.
How	Establish a good quality management system and the assessment of its adequacy. Periodic conformance audits of the operations of the system.	Finding & eliminating sources of quality problems through tools & equipment so that customer's requirements are continually met.
What	Prevention of quality problems through planned and systematic activities including documentation.	The activities or techniques used to achieve and maintain the product quality, process and service.
Responsibility	Everyone on the team involved in developing the product is responsible for quality assurance.	Quality control is usually the responsibility of a specific team that tests the product for defects.
Example	Verification is an example of QA	Validation/Software Testing is an example of QC
Statistical Technique	Statistical Tools & Techniques can be applied in both QA & QC. When they are applied to processes (process inputs & operational parameters), they are called Statistical Process Control (SPC); & it becomes the part of QA.	When statistical tools & techniques are applied to finished products (process outputs), they are called as Statistical Quality Control (SQC) & comes under QC.
As a tool	QA is a managerial tool	QC is a corrective tool

Inspection Requirements (for MW and kW Class Turbines):

The Turbines are manufactured in line with the design requirements as per IEC 61400 –Ed3 standards OR , GL 2010 standards and each components used for assembly of Turbines are to be inspected and accepted as per specification before taking in to assembly. The major components are listed below (For M.W Class Turbines.)

1. Generator Assembly.
2. Magnet Assembly.
3. Stator Assembly
4. Nacelle frame.
5. Tubular Tower of Various sizes.

6. Different sizes of Fasteners.
7. Different sizes of cables.
8. Yaw Gear boxes.
9. Hyd. Power packs.
10. Yaw bearings /Pitch bearing/ Rotor Bearing.
11. Brakes and Assembly.
12. Proximity sensors /Limit switches./ Encoders
13. Rotor Hub assembly.
14. Control panels. & Convertors..
15. Grease pump /Lubrication systems.
16. Rotor blades.
17. Transformers.

18. Brakers/CTPT.
19. Controllers.
20. Paints.

The major components are listed below (For K.W Class Turbines).

1. Asynchronous Induction generator.
2. Pumps fitted with electric motor
3. Planetary/Helical Gear box.
4. Solenoids/Proximity sensors
5. Level/Cam/Limit switches.
6. Hyd. Power pack.
7. Slow speed/High speed/Yaw brakes.
8. Rotor Hub assembly.
9. Nacelle Frame.
10. Lattice/Tubular Towers./Head end Structure/Tower top.
11. Control panels./Controller.
12. Various capacity/sizes of Power/Control Cables.
13. Yaw Gear box.
14. Grease pump/Lubrication systems.
15. Brake disc./C.F.Switch assembly.
16. Main Bearing/yaw Bearing
17. Rotor Blades
18. Turboflex assembly.
19. Slip clutch assembly.
20. Fastners.

Records for INSPECTION

- ◆ Approved drawing.
- ◆ Approved data sheet.
- ◆ Bill of material.
- ◆ Regulation/Specifications.
- ◆ Quality assurance Plan duly accepted.
- ◆ Check sheet.
- ◆ Calibrated measuring Instruments.
- ◆ Inspection visit report format.

Raw material test certificates to be Witnessed OR verified by the Inspector for the following

- 1) Steel casting and Plates, Rods etc.,
- 2) Shaft material,
- 3) Insulation material
- 5) Rubber seal/'o' ring
- 6) Paints and varnish
- 7) Oil/Grease.

Documents to be verified/Witnessed at Manufacturers works.

1. Routine Test certificate
2. Type test certificate issued Third party.
3. Warranty/ Guaranty certificate.
4. In process test reports.

5. Stage and Final assembly reports.
6. Final Test Reports.

Final Inspection clearance certificate:

This Clearance certificate issued based on the satisfactory inspection, witness & Review of various tests conducted by the manufacturer as per standard requirements on various components used for Turbine assembly.

Any minor deviation that may not affect the performance may be specifically passed on deviation for close monitoring at assembly and in final testing/operation.

Inspection/Verification of Goods transported to site.

1. Proper packaging against any damages may occur in transport.
2. Packing of Loose components in wooden cases and its worthiness.
3. Special packing of Rotor blades for Transport on Highways.
4. Wooden crate package for Control panel and convertor.

Site Inspection Requirements:

1. Soil test for verification of SBC.
2. Checks and verification during Digging of Soil for Tower Foundation.
3. Measurement of Dimensions for Foundations as per Drawings.
4. Verification of steel and cement being used for concreting.
5. Inspection of P.C.C works for Foundation and entry in check sheet.
6. Verification of Steel rods laying and arranging as per drawing.
7. Checking of concrete mixing.
8. Cube test for concrete.
9. Witness of R.C.C. for foundation.
10. Fixation of Tower bolts in Tower bed.
11. Verification of Tower Installation complete.
12. Verification of Cable lying, Nacelle, Generator Rotor assembly fixing etc.
13. Recording the data in Check sheet.
14. Checks on complete work in Control rooms including Installation of control and convertor panels.
15. Verification work of Pre-Commissioning of turbine.
16. Witnessing/Recording Data on commissioning the Turbines.

Requirements of Inspection Tools and Gauges for Wind Turbine Manufacturing

Rotor Blades Equipments.
 Digital Weighing Balance 30 kg (CAS DZ)
 Digital Weighing Scale 3 ton (PF)
 Digital Weighing Scale 5 ton (PF)
 Digital Thermo Hygrometer
 Analog vernier calliper
 Digital Vernier Caliper
 Dial Thickness gauge
 Micro ohm meter

FINAL TESTING EQUIPMENTS

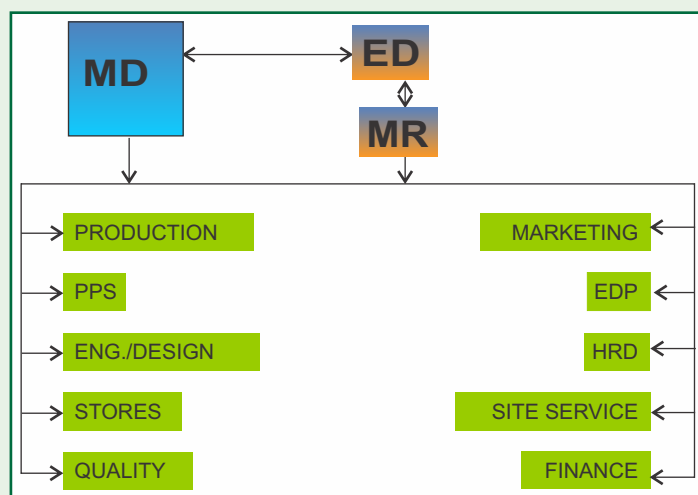
1	Power analyzer set
2	Baker Automatic Winding test Instrument
3	Digital Tong Tester
4	AC Hipot Test
5	Oscilloscope
6	PLC simulated Test bench
7	Milli amps Meter
8	Multimeter
9	Digital Tong Tester
10	Phase sequence indicator
11	PLC simulated Test bench
12	Digital Tong Tester
13	Phase sequence indicator
15	Multimeter
16	Baker Automatic Winding test Instrument
17	AC Hipot Test
18	Insulation Tester
19	Phase angle Measurement
20	Clamp meter
21	True RMS Multimeter
22	Multimeter
23	Power Analyser
24	CRO
25	Multimeter
26	Clamp meter
27	Phase angle Measurement
28	Green Lee Infrared thermometer
29	Differential Probe

MAIN ASSEMBLY CHECKING INSTRUMENTS

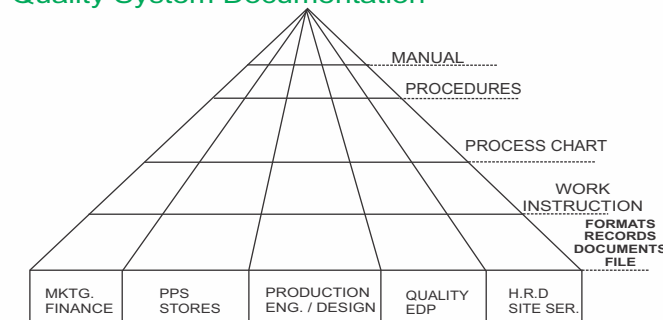
1	Vernier Caliper
2	Vernier Height Gauge
3	Depth Vernier
4	Depth Micro meter
5	Inside Micro meter
6	Out side Micrometer
7	Bore Dial Gauge With dial
8	PI Tape
9	Slip Gauge Block
10	Dial Indicator
11	Dial Gauge
12	Torque Wrench
13	Tread Plug Gauge
14	Oscilloscope
15	Digital Insulation Meter RISH Insu 2081338
16	Digital Insulation Meter RISH Insu 20

ISO 9000:2008 Quality Management Systems

- Customer-focused organization
- Involvement of People
- Process Approach
- Systems approach to Management
- Continual Improvement
- Quality, Product, Quality Policy
- Quality Planning
- Quality Control, Quality Assurance
- Quality Improvement
- Continual Improvement
- Nonconformity
- Procedure

QUALITY SYSTEM ORGANISATION CHART**QUALITY POLICY**

The Quality policy is decided by the Managing director or the Top official of the company based on the company's business strategy and implemented in various departments for ISO system implementation.

Quality System Documentation

If Every Thing Found Satisfied Proceed For Internal Audit.

Confident Path To Iso 9000 Certification

Certified For Iso 9000, Does Not Mean That, A Company Has Actually Become A World Class Company. It Only Means Company Is Serious About Quality.

ISO-9000:



- ◆ Provides an opportunity to create and improve quality systems of the company
- ◆ It also helps to assess the companies quality requirements
- ◆ Helps company to proceed further on implementing TQM
- ◆ Improve quality of the product within a short span.
- ◆ Finally the path to Excellence

General Guidelines For Wind Turbine Quality Management & Certification.

- ◆ The definitions of ISO 9000 apply.
- ◆ Manufacturer organizational unit which manufactures a product.
- ◆ Quality management comprises all planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.
- ◆ The QM system comprises the organizational structure responsibilities, procedures, process and resources for implementing quality management.
- ◆ The Quality audit is systematic and independent examination to determine whether quality activates and related results comply with planned actions, and whether these actions are implemented efficiently and are suitable to achieve the objective.
- ◆ The QM system documentation comprises all the documents describing the functions of QM system.
 1. QM Manual.
 2. QM Procedures.
 3. QM Process
 4. QM work Instructions.

Requirement for the Quality Management:

As a minimum the QM systems shall meet the requirements of the QM model according to ISO 9001.

The QM system to be worked out in detail in writing as per ISO-9001.

Certification of the Qm System

A certification of the QM system by a certification body accredited according to EN 45012 is as a rule, regarded as a prerequisite. The general procedure for the certification is described below.

- ◆ Checking of the QM system documentation in relation to the requirements of ISO 9001.
- ◆ Successful completion of the initial audit by certification body. This includes a check on whether the QM activities set out in the QM system documentation are being implemented.
- ◆ The validity of the certificate is maintained by means regular audit.

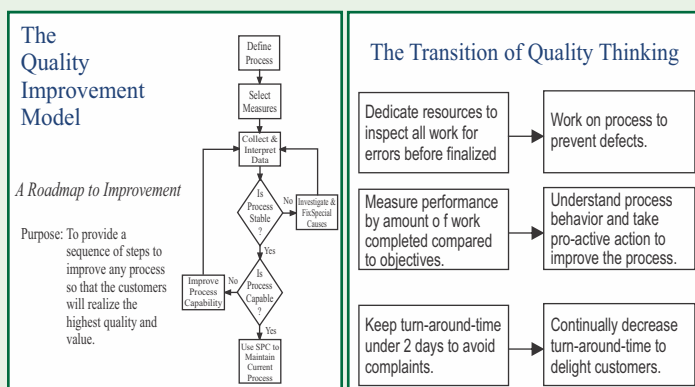
- ◆ The audit are carried out at set intervals in time (once a year and, if necessary more often).

Failure Mode Effective Analysis in QA/QC:

FMEA –BS EN 60812:2006-Analysis techniques for system reliability –Procedure for failure modes and effects analysis (FMEA)

FMEA is a systematic, proactive method for evaluating a processing to identify where and how it might fail and to assess the relative impact of different failures, in order to identify the parts of the process that are most in need of change .FMEA includes review of the following.

- ◆ Step in the Process.
- ◆ Failure Modes (what could go wrong).
- ◆ Failure causes (why would the failure happen).
- ◆ Failure effects (what would be the consequences of each failure).



Comparison of Conventional Management Thinking and Total Quality Management Thinking.

Conventional Management Thinking

- Quality improvement costs money and time
- Work is a series of discrete activities
- Quantity is an important as quality
- 95% quality is great.
- Quality is the result of better inspection
- Suppliers must be kept on their toes.
- Customers are outsiders you sell to.
- To achieve quality we need more and better people

Total Quality Management Thinking

- Quality improvement saves money and time
- Work is an integrated process.
- Without quality, quantity is irrelevant.
- Only 100% quality will do.
- Quality is built in the product and process from the start.
- Suppliers must feel like they are your partners.
- Customers are an integral part of your organization.
- Quality can be achieved with the people we have right now—simply by leading and training them differently.

