Key Current Issues in Wind Power Asset Management:

A report on the latest in operations and maintenance from the American Wind Energy Associations Wind Power Asset Management Workshop, January 10-11, 2006 in San Diego

By Peter Golbeck, VP Engineering & Condition Monitoring, WindRisk Corporation

This inaugural AWEA Asset Management Workshop, said by many in the industry to be long overdue, was held on January 10-11, 2006 in San Diego, CA and was well attended, by about 130 wind industry asset management and maintenance professionals.

It is noteworthy that the overwhelming mood exhibited by the attendees of the workshop was one of frustration with the industry's inadequate focus to date on asset management and operations and maintenance issues and the sense that these issues are unfortunately treated by the industry at large as very much of "second tier" importance. The apparent inability of the industry to confront, and/or provide operations and maintenance professionals with the tools needed to combat, the significant negative operations and maintenance, reliability and lifecycle issues surrounding the industry is clearly an increasingly widely held and developing concern.

Three main topic groups were covered by panelists, with an active floor discussion:

1) Operation and Maintenance

2) Project Management

3) Health and Safety

All presentations were very informative and caused significant and active discussions.

Speakers included:

Jan Paulin, Padoma Wind Power, LLC
Patrick Caramante, Garrad Hassan
Raul Manzanas & Larry Bester, Acciona Energia
Mark Ahlstrom, WindLogics Inc.
Tom Amis, Baker Botts, LLP
Ken Kaser, GE Energy
Gary LeMoine, Health & Safety, PPM
Edward W. Zaelke, Morgan,Lewis & Bockius LLP
Thomas Jonsson, Moventas Inc.
Jim Walker, enXco
Sandy Butterfield, National Renewable Energy Labs
Brian McNiff, McNiff Light Industry

The key highlights of the panel topics and the associated discussions are set out below:

Operation & Maintenance:

This topic proved to be the most controversial and was hotly debated. It was first presented by Raul Manzanas and Larry Bester, but it was soon joined by every other speaker. The audience was literally speechless when they heard of "the gearbox epidemic" and were given some very sobering statistics from Acciona Energia's operating experience with wind assets of comprising a total of approximately 3000 turbines in Spain over the past 8 years.

"The present gearbox epidemic"

In 2004, the average gearbox life was only 3-1/2 years. Acciona Energia found it necessary to conduct their own root cause analysis with the gearboxes and designed and applied retrofit solutions in order to extend the working life. Raul also reported other unexpected failures of generators, yaw systems, hydraulic failures and control failures. Some of Raul's slides showed statement phrases on the bottom such as:

"A need to be more professional"

Raul stated that onshore projects with high towers such as 85 to 100 meters will not be able to economically sustain the present rate of gearbox failures, because of, among other issues, the very expensive crane requirements for these tower heights. He said that the typical 600 Kw turbines 10 years ago required cranes that would cost only a few thousand dollars. By comparison, today's megawatt class turbines on 100 meter towers require cranes that cost $100,000.00 and inherent design inadequacies which require frequent crane usage will quickly erode O&M costs and project profitability.

The audience had many follow up questions after this "reality check" from Raul and Larry. Answers on this subject did not come clearly or easily, highlighting the magnitude of the difficulties facing the industry in this area.

"More questions than answers"

Raul and Barry stated that their company believes that condition monitoring systems including oil particle counters and correctly designed, organized and usable SCADA data is the correct path to follow. Acciona is currently testing 5 European condition monitoring systems side by side to evaluate them for effectiveness. Comments from GE Energy and Vestas representatives such as "the jury is still out on condition monitoring for wind turbines" struck many in the audience as remarkable. During the panel discussion, Sandy Butterfield from the National Renewable Energy Labs commented on the difficult issue of setting condition monitoring baseline values and alarm thresholds, as these often require extensive data analysis. Sandy, as well as other panelists, revealed another sobering fact to the audience, being that most SCADA systems provided by the turbine manufacturers are not adequate to be an effective tool for an effective O&M strategy.

"Most Turbine Manufacturers' SCADA systems are not adequate for effective O&M"

It was noted that modern turbines with fast pitch and variable speed should have 20 Hz data files to properly analyze control problems, given the amount of data needed to be processed in the case of these modern, more complex machines. They should also have second data fault files. Sandy, as well as Brian McNiff, talked extensively of the important need to properly manage operational SCADA files in order to clearly understand base line data; these files must be properly identified with the different plant configuration information and must be available to the O&M provider so effective use can be made of it in the O&M process.

The Panel concluded that SCADA data plus condition monitoring system data can indeed be a powerful tool to detect and diagnose problems:

"Condition monitoring data, when coupled with effective SCADA systems, represent a powerful tool"

Health and Safety:

The health and safety session was presented by Gary LeMoine, but many other speakers also commented on the importance of safety in the operational context, with this being presented as a top priority for the industry. Key rationales for this were that the nature of wind energy, as clean power, also demands that safety be a top priority, with it being second nature to everyone involved and forming part of the work culture. It was noted that the tools for this subject are training, safety meetings, safety equipment and safety work procedures. The training must revolve around electrical and mechanical safety with emphasis on working at heights and training in crane operation and rigging. The audience was reminded of the recent two fatalities, one in the US and one in Denmark, and it was pointed out that these were fully preventable, and the industry cannot afford any fatalities, as they are both unnecessary and also tend to mar its "clean" image.

"The Industry must not have any fatalities – all wind industry fatalities are preventable by safety training and procedures"

Panel discussion:

Many questions centred around identifying the correct and most effective tools for maintaining wind assets. In summary, the most important tools identified and discussed are listed below:

1) Condition monitoring systems: these must be sensitive, must have prescriptive message output, and be perfectly archived.

2) Correct SCADA data: including base line data and fault file data, all properly archived.

3) Inline gearbox oil particle counter: can be part of the condition monitoring system.

4) Well trained technicians: they must be alert to issues and learn to listen, smell and feel for problems, in a way that machine systems cannot.

5) Gear oil tribology analysis: can be part of the condition monitoring system.

6) Weather forecasting: can add value to energy sold, as well as enabling outages to be planned for maintenance, including crane work, thus leading to increased profitability.

7) Turbine manufacturers must provide realistic life cycle estimates of components: presently this is not the case and is a major problem for the industry.

8) Develop sustainable O&M skill sets in the US: Universities and Technical Colleges must turn out skilled certified technicians for this fast growing, but under-served market.

9) Forming Turbine User Groups: enable sharing of operational experience and also to facilitate sharing of key items, such as cranes, spares, special tools, O&M solutions.

10) Feedback of issues to the turbine manufacturers: fosters good relationships and the effective communication of issues and solutions to everyone's benefit.

Summary

In summary, this was an extremely informative conference that gave the audience a very realistic overview of the key current issues confronting the asset management sector. AWEA and their sponsors are to be congratulated for organizing this much-needed and well run workshop in San Diego. In view of the many questions raised, I suggest that it be made a yearly event and that it be shaped into the same format as is commonly used in the Predictive & Preventative Maintenance conferences for the mainstream power industry in the USA, such as for nuclear and coal power plants. I also recommend that targeted equipment and services vendors be added to the conference in future as exhibitors, as also occurs in the mainstream power industry events of this type; such vendors would include those with the latest predictive and preventive maintenance tools, such as condition monitoring systems, inline oil particle counters, tribology systems and techniques, infra-red photography, fibre-optic strain gauge systems, ultrasound detection, corona detection, electrical diagnostics tools (such as cable testers, motor testers, and instruments for calibration), as well as special tools for specific tasks, such as torque wrenches, lifting devices and so on.

About the Author:

Peter Golbeck has worked for 40 years in the nuclear power industry as an Electrical Technician, as well as a Maintenance Manager and Condition Monitoring Specialist. He has also been instrumental in developing the Cold Climate Package for the 600 KW Tacke turbine in Ontario and has operated and maintained wind turbines for the leading Canadian utilities, Ontario Hydro and Ontario Power Generation. Currently he is working as VP-Engineering and Condition Monitoring for WindRisk Corporation, based in Vancouver, Canada.