# Comments and proposals to IEC61400-25 DK

*Abstract: Comments to IEC61400-25 DK from a Condition Monitoring View*

Revision history

| Rev. | Date | Init. | Comment |
|---|---|---|---|
| 001 | 02-08-29 | AJ | Note created |

# 1. Content



# 2. Introduction

Referring to the Meeting at Vestas 27/08/2002 concerning the proposed IEC61400-25 standard, Gram & Juhl Aps (GJ) sends it comments from a Condition Monitoring Viewpoint. A standard is very welcome and necessary in this field, which will make it easier to apply CM systems and solutions to various wind turbines and wind power plants.

This document is in a draft state and probably need reworking if it is of any interest to the committee.

# 3. Background

The purpose of (permanent) condition monitoring is to

- Prevent breakdowns (red/yellow/green health indicator)
- Optimize and plan service and maintenance

Many different techniques may be used, complementing each other. GJ at the moment mainly uses vibration monitoring i.e. MCM machine condition monitoring and SVM structural vibration monitoring. Permanent condition monitoring based on permanent strain measurements may also be relevant in the future. These techniques rely on additional information from the Wind Turbine surveyed, e.g. RPM, Active Power, Wind speed, temperatures etc.

Condition monitoring in a Wind Power Plant gives very good possibilities to make an effective and advanced condition estimate due to the availability of a large statistical material, i.e. all the data and analyses produced. This demands a very systematic, automatic and organized approach to handle the huge amount of data produced.

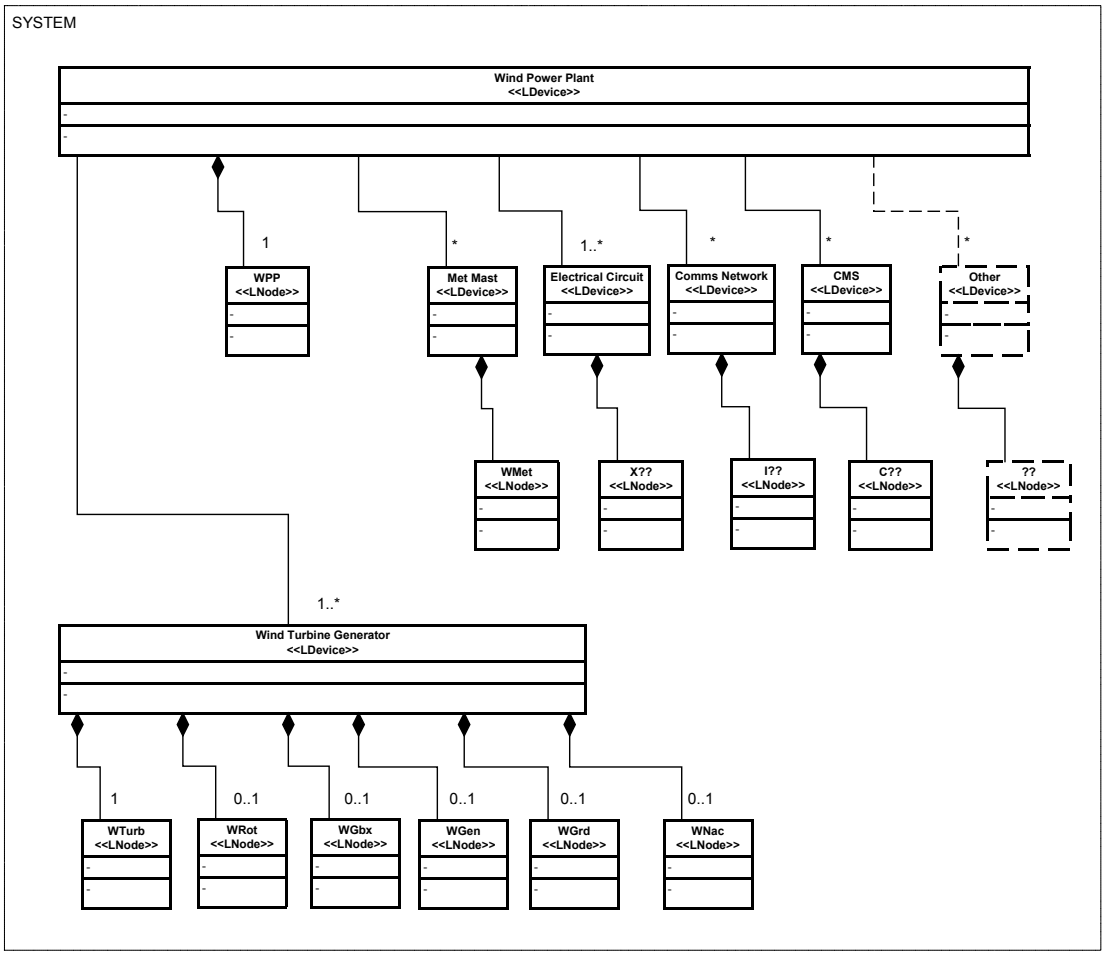
The goals are to

- Give and estimate for the condition, “red, yellow or green”
- Estimate time to service for a given component

## 4. Concerns

For the CM system it is essential to be able to gain information from other logical devices and nodes such as Rotor RPM, Gearbox RPM, Active Power, wind speed etc. etc. Sine load condition changes very quickly in a wind turbine, timestamp resolution and update speed down to 10 ms is desirable. Time synchronization in a wind turbine as well as in a wind power plant is NOT a trivial issue!

## 5. Proposal




GJ proposes to implement CM as a logical Node WTCC in the wind turbine on same level as the other nodes (Wturb, Wrot, …) shown above

| **Description** | **Lnode** |
|---|---|
| CM for various surveyed components in the wind turbine as bearings and structural elements | WTCC Wind Turbine Component Condition |

| LN classes | Description |
|---|---|
| WTUR | general wind **turbine** information |
| WGEN | wind **generator** information |
| WGRD | wind **grid** information |
| WNAC | wind **nacelle** information |
| WGBX | wind **gear box** information |
| WBRK | wind **brake** information |
| WROT | wind **rotor** information |
| WYAW | wind **yaw** information |
| WSHF | wind **shaft** information |
| WTOW | wind **tower** information |
| WBEC | wind **beacon** information |
| WCNV | wind **converter** information |
| WGRD | wind **grid connector** information |
| WSFT | wind **softstart** information |
| WMET | wind **meteorological** information |
| WTCC | wind **turbine component** condition |

GJ proposes the WTCC logical node as follows

| **WTCC class** | | | | |
|---|---|---|---|---|
| **Attribute Name** | **Attr. Type** | **Explanation** | **T** | **M/O** |
| LN Name | | Inherited from Logical-Node Class | | |
| **Data** | | | | |
| ***Basic Logical Node Information*** | | | | |
| NamPlt | LPL | Name plate + MORE | | M |
| | | LN Inherits all Mandatory Data from Basic Logical Node Class | | M |
| Oph | INS | Operation hours | | O |
| OpCntRs | ISC | Resetable operation counter | | O |
| ***Status Information*** | | | | |
| HealthInd | INS | General Health Indicator ("red/yellow/green") | | O |
| MinTimeToService | INS | The component with the shortest time to service | | O |
| ***Measured values*** | | | | |
| Blade1 | VPP_WTCC | Structural Vibration Measurement | | O |
| Blade2 | VPP_WTCC | Structural Vibration Measurement | | O |
| Blade3 | VPP_WTCC | Structural Vibration Measurement | | O |
| NacelleFront | VPP_WTCC | Structural Vibration Measurement | | O |
| NacelleRear | VPP_WTCC | Structural Vibration Measurement | | O |
| TowerTorsion | VPP_WTCC | Structural Vibration Measurement | | O |
| Tower1 | VPP_WTCC | Structural Vibration Measurement | | O |
| Tower2 | VPP_WTCC | Structural Vibration Measurement | | O |
| MainBearing1 | VPP_WTCC | Vibration Measurement | | O |
| MainBearing2 | VPP_WTCC | Vibration Measurement | | O |
| GearHs1 | VPP_WTCC | Vibration Measurement | | O |
| GearHs2 | VPP_WTCC | Vibration Measurement | | O |

| | | | | |
|---|---|---|---|---|
| GearLs1 | VPP_WTCC | Vibration Measurement | | O |
| GearLs2 | VPP_WTCC | Vibration Measurement | | O |
| Generator1 | VPP_WTCC | Vibration Measurement | | O |
| Generator2 | VPP_WTCC | Vibration Measurement | | O |
| Pump1 | VPP_WTCC | Vibration Measurement | | O |
| Pump2 | VPP_WTCC | Vibration Measurement | | O |
| Fan1 | VPP_WTCC | Vibration Measurement | | O |
| Fan2 | VPP_WTCC | Vibration Measurement | | O |
| StrainBlade1 | VPP_WTCC | Structural Strain Measurement | | O |
| StrainBlade2 | VPP_WTCC | Structural Strain Measurement | | O |
| StrainBlade3 | VPP_WTCC | Structural Strain Measurement | | O |
| TowerStr1 | VPP_WTCC | Structural Strain Measurement | | O |
| TowerStr2 | VPP_WTCC | Structural Strain Measurement | | O |
| ***Controls*** | | | | |
| ResetAlarm | ISC | Rest all alarms | | O |
| ***Setpoints*** | | | | |
| Blade1 | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| Blade2 | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| Blade3 | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| NacelleFront | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| NacelleRear | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| TowerTorsion | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| Tower1 | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| Tower2 | VPP_WTCC | Alarm Setpoint Structural Vibration Measurement | | O |
| MainBearing1 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| MainBearing2 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| GearHs1 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| GearHs2 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| GearLs1 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| GearLs2 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| Generator1 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| Generator2 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| Pump1 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| Pump2 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| Fan1 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| Fan2 | VPP_WTCC | Alarm Setpoint Vibration Measurement | | O |
| StrainBlade1 | VPP_WTCC | Alarm Setpoint Structural Strain Measurement | | O |
| StrainBlade2 | VPP_WTCC | Alarm Setpoint Structural Strain Measurement | | O |
| StrainBlade3 | VPP_WTCC | Alarm Setpoint Structural Strain Measurement | | O |
| TowerStr1 | VPP_WTCC | Alarm Setpoint Structural Strain Measurement | | O |
| TowerStr2 | VPP_WTCC | Alarm Setpoint Structural Strain Measurement | | O |

The Node uses specific common data classes WPP_WTCC.

GJ proposes the specific common data class WPP_WTCC inherited form WPP_MV as follows

| WPP_VIP class | | | | | |
|---|---|---|---|---|---|
| **Attribute Name** | **Attribute Type** | **FC** | **TrgOp** | **Value / Value Range** | **M/O/C** |
| DataName | Inherited from Data Class (see IEC 61850-7-2) | | | | |
| **DataAttribute** | | | | | |
| *measured values* | | | | | |
| inst.WPP_Mval | AnalogueValue | sv | dchg | Vibration Measurement<br>This is the overall value (vector length) according to ISO 10816.<br><br>Structural Vibration Measurement<br>Displacement<br><br>Structural Strain Measurement<br>Strain | M |
| inst.q | Quality | mx | | | M |
| inst.t | TimeStamp | mx | | | M |
| stats.mean | AnalogueValue | mx | | | M |
| stats.max | AnalogueValue | mx | | | M |
| stats.min | AnalogueValue | mx | | | M |
| stats.sd | AnalogueValue | mx | | | M |
| stats.endt | TimeStamp | mx | tchg | | M |
| stats.readings | AnalogueValue | mx | | | M |
| stats.duration | AnalogueValue | mx | | | M |
| HealthInd | Health indicator | | Tc | Red/yellow /green | M |
| TimeToServ | Time To Service | | Tc | Time to service | O |
| Health | Relative health measure | | Tc | 0 – 100 (best) | O |
| *configuration, description and extension* | | | | | |
| D | Description | dc | | Information description regarding the measurement conditions e.g. Active Power etc. | M |
| Units | SIUnits | cf | | | M |
| Bwidth | BandWidth | cf | | | M |
| Alarm | Enable Alarm | Cf | | | O |
| AlarmReset | Reset any Alarm | Cf | | | O |
| AlarmSP | Alarm setpoint | Cf | | | O |
| HealthSP | Health Setpoint | Cf | | | O |
| **Services** | | | | | |
| | | | | | |

***Note:*** *Trigger options TrgOp are to be determined. Functional constraints are not considered in details.*

## 6. Resume

GJ proposes a logical node WTCC for implementing condition monitoring on wind turbines. For fast changing signals (synchronized) time stamping with resolutions and sampling rate down to 10 ms is very useful for condition monitoring analysis correlating many process parameters.

We hope that that these comments can be incorporated in the standard in a useful manner.

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