Heavy Duty VoIP Telephones

Application Guide:
Offshore Wind Turbines

This document is examining how Heavy Duty VoIP Telephones can help improve communication in Offshore Wind Turbines. It will also look at critical issues that needs to be addressed when selecting an effective telephone system in this environment.

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A sustainable electricity system for the future
Since earliest times, man has harnessed the power of the wind, with the first mill recorded as long ago as the 6th century AD. The Wind Turbine technology has developed and matured over the years and is now the fastest growing energy sector worldwide. Renewable energy is also vital in the fight against climate change and technologies such as wind energy can help in building a sustainable electricity generation system for the future.

Key Facts about Wind Power
- Renewable wind power must account for 20% of Europe's energy usage by 2020, according to EU Targets. China is committing to 15%. The US have no federal targets, although most states have goals for renewable energy generation
- The wind industry internationally is able to provide at least 12% of the world's future electricity needs by 2020 – even if current consumption doubles.
- Wind has been the fastest growing energy technology in the world for the past decade, and the pace of growth has been greatest in Europe, where around 80% of the world's wind equipment is installed .
- Much of that growth is due to cost reductions and progressive government policies.
- If global emisssions are to be halved by 2050, investment in renewables and clean technologies must rise fourfold.

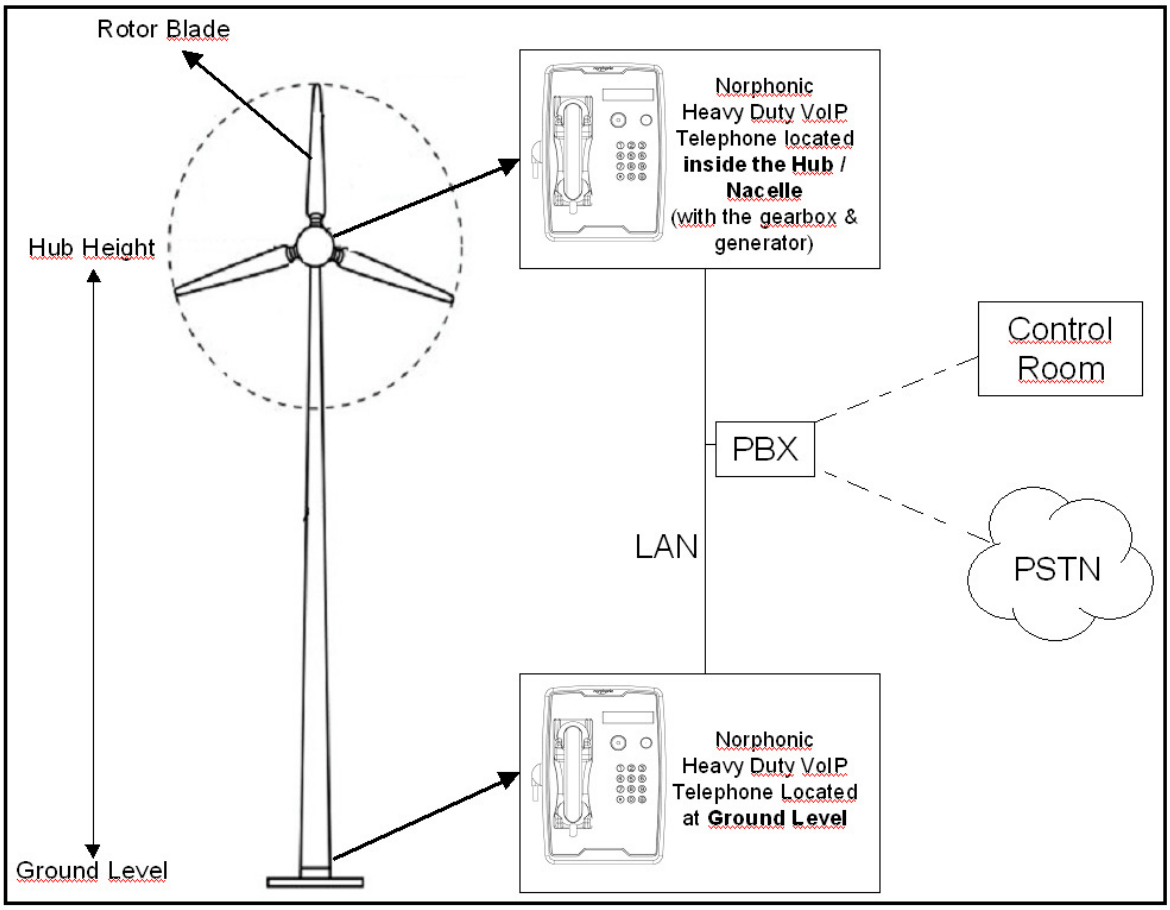
Offshore Wind Farms
Offshore wind farms are an exciting new area for the industry, largely due to the fact that there are higher wind speeds available, and economies of scale allow for the installation of larger size wind turbines offshore.

In modern wind turbines, all information related to the turbine performance is recorded by computers and transmitted to a control centre, which can be many miles away. Wind turbines are not physically staffed, although each will have periodic mechanical checks, often carried out by local firms. The onboard computers also monitor the performance of each turbine component, and will automatically shut the turbine down if any problems are detected, alerting an engineer that a site visit is required.

Heavy Duty VoIP Telephones in the Wind Power Industry
In summary, there are three key reasons why Heavy Duty VoIP Telephones need to be installed in wind farms:
- Service Engineers or Maintenance Staff need to have the opportunity to communicate with the outside world to ensure the business critical operation of the wind power system, including service, maintenance and repair issues.
- Mobile telephones have limited coverage in remote areas, and even when they have coverage, high ambient noise (from wind or machinery) means that these telephones do not have a loud enough sound to be clearly heard.
- Conventional telephones are not robust enough to perform in these industrial areas, as communications technology utilised need to be weather proof and able to deal with ongoing exposure to vibration, dust, extreme temperatures and seawater.

Norphonic has a long history of delivering Heavy Duty VoIP solutions inside Wind Turbines in many countries, ensuring essential voice communications when it is most needed. In the remaining part this document we shall look at some of the issues that needs to be addressed when selecting your telephone solution.

Primary Considerations - VoIP Telephones in Wind Farms
Keeping in mind the average size of an Offshore Wind Turbine (120m high with 40m long blades) there are usually two Heavy Duty VoIP telephones installed in a turbine, so that engineers are able to communicate with each other during a site visit. The below figure illustrates a typical example installation. In this case the telephones are connected via LAN (Local Area Network) to each other, and then to a central control room or to the PSTN (Public Switched Telephone Network) via a PBX (Private Branch Exchange) or VoIP Gateway solution to enable communication with the outside world.



VoIP vs. Analogue Telephones?
In Wind Turbines, the telephone of choice will almost exclusively always be a VoIP telephone. There are many reasons for this, but mainly, since the VoIP telephone use data networks it has additional functionalities that are partiularly important when it comes to Wind Turbines.

One feature, found in all Norphonic VoIP telephones, is the opportunity for the telephone to carry out self monitoring and automatic fault checks of all telephone components, which is useful because the turbine owner would not want to dispatch a service engineer if not strictly neccessary due to the high cost involved with these maintenance visits.

Another key feature, is the remote management functionality, whereby a remote operator has the opportunity to load telephone software updates remotely, switch the telephone on/off, sense if the hook is in an on/off position and monitor condition of telephone components.

Finally, a VoIP telephone can be used to send data as well as voice, which means that service engineers can send pictures of faulty equipment as the case may be, or other data if deemed neccessary.

What to look for in a Heavy Duty VoIP Telephone solution?
There are many issues that needs to be addressed prior to commissioning a Heavy Duty VoIP system for a Wind Turbine, such as evaluating the installation environment, functionality and temperature ranges. Below are some key pointers to look at when choosing a Heavy Duty VoIP Telephone for your Wind Turbine Application:

- Is the telephone based on open SIP standards which will allow connectivity to your existing networks and systems? IF the product is based on open standards, this will also mean that the product installation can be upgraded or changed in the future without having to change the entire system.

- Is the telephone weather proof? Wind Turbines can be notoriously dirty environments with large amounts of dust and grime collecting over time. It is therefore recommended that the telephones are dustproof / have the highest protection available against Dust ”6”, and that the unit is water-proof to a degree of ”5” –An IP rating to IP65 is recommended for both offshore and onshore wind turbines. See definition of Ingress Protection in the below Glossary for further information.

- Does the telephone incorporate a self monitoring and fault check function? This is a feature available on all Norphonic telephones, which means that the status of the telephones can be monitored from a remote location, saving you considerable maintenance costs.

- What is the telephone operation temperatures? wind turbines should be able to operate in temperatures between -20° C and +55° C

- Does the telephone incorporate VSQ - Voice Sound Quality? This is a standard feature in all Norphonic telephone systems, ensuring loud and clear sound, even in noisy ambiance areas.
- Is the telephone condensation proof? –This can otherwise lead to severe problems in operation as water can easily form inside the unit, affecting performance.

- Does the VoIP telephone incorporate a QoS – Quality of Service functionality? This feature, found in all Norphonic telephones, guarantees a certain level of performance in a data flow, ensuring impeccable delivery of voice communications in an IP Network.

- For offshore wind turbines, is the telephone seawater resistant?

- Has the telephone been installed in other Wind Turbines in the past? –It is always reccommended that you check if the telephone has been used for this particular purpose in the past to evaluate suitability.

- Is the telephone CE approved? CE marking means that the product is certified to meet EU consumer safety, health or environmental requirements. End users should be aware that some telephones use the intentionally confusing term ”CE” for ”China Export”, and the only way consumers can check this is to closely examine the CE mark/ logo as the two logos are very similar.

- Is the telephone highly visible and identifiable so that they can easily be located by your onsite service engineers?

GLOSSARY

- **Norphonic** – A leading manufacturer of heavy duty VoIP telephones that are used in a wide variety of industrial applications worldwide, including wind turbines, transport (air, sea, road, rail), industry, mining, public places and other emergency areas.
- **Heavy Duty Telephone** – generic term for industrial type telephones used in challenging environments. For example telephones that that are exposed to high levels of air humidity, dust, vibration, shock, extreme temperatures, rain, seawater or attempted vandalism. Heavy duty telephones is used in many applications including transport, offshore, production floors, chemical processing sites, mines, transit tunnels, university campuses and other public places.
- **VoIP Telephone** – Voice over Internet Protocol is a general term for delivery of voice communications (voice, facsimile and voice-messaging applications) over an IP network, rather than the public switched telephone network (PSTN). Other related terms frequently encountered and synonymous with VoIP are IP telephony, Internet telephony, voice over broadband (VoBB), broadband telephony and broadband telephone.
- **SIP** – Session Initiation Protocol, is the most widely used signaling protocol for controlling multimedia communications sessions (such as voice and video footage) over Internet Protocol (IP).
- **Industrial Telephone** – General term for a telephone used in challenging areas, for example production floors, wind turbines, machinery or other industrial environments.
- **Point to Point Communication Telephone** – used to communicate between two points, often installed in large lifting machinery, cranes, underground mines and wind power systems. Usually, point to point communication telephones are hooked up directly with each other, eliminating the need to go through a private automatic business exchange (PABX) or a common telephone carrier**.**
- **Service Telephone** – used by service engineers and maintenance personnel to communicate with a central control room
- **Seawater Resistant Telephone** is a description of telephones that are resistant to corrosion from seawater, often metal coated with a protective solution paint.
- **Vibration Proof Telephone** – Description of a telephone that is tested and approved to withstand ongoing vibrations, frequently encountered in emergency roadside or railway applications.
- **Shock Proof Telephone** – Description of a heavy duty telephone that has been tested and approved against shock and heavy impact.
- **IP Rating** / **Ingress Protection Rating** / **Index Protection** –The IP rating classifies the degrees of protection provided against the intrusion of solid objects, dust, accidental contact, and water in electrical enclosures. The standard aims to provide users more detailed information than vague marketing terms such as "waterproof". The standard consists of the letters IP followed by two digits and an optional letter: for example, the Norphonic Heavy Duty VoIP telephone have been approved to the highest rating against dust *"dust proof"* (6) and can be sprayed with water by a water jet from any direction without any harmful effects (5). Therefore, in this case, the Norphonic Heavy Duty VoIP telephone has a rating of "IP65".
- **Weather Resistant Telephone** / **Weather Rating** – Usually a common descripton of a telephone that is rated according to the IP (Ingress Protection) approval tests, but is sometimes also used to define a telephone which can withstand extreme temperatures. See "IP Rating / Ingress Protection Rating / Index Protection" for further information.
- **Waterproof Telephone** / **Water Proof Telephone** - Description of a telephone that is sealed and immune to water, frequently needed in outdoor environments exposed to rain, snow and mist. However, the word "waterproof" is a common marketing term, and is better defined in the Ingress Protection Rating codes, see also " IP Rating / Ingress Protection Rating / Index Protection " for further information.
- **Dust Proof Telephone** – Description of a telephone that is sealed and immune to dust. Such telephones are regularly needed in dirty environments such as inside heavy duty production

environments and utility sites. See also ”IP Rating / Ingress Protection Rating / Index Protection” for further information.

- **RoHS** – product approval code, confirming that the telephone units does not contain lead, mercury, cadmium, hexavalent chromium, poly-brominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).
- **CE mark** - is a mandatory conformity mark on many products placed on the single market in the European Economic Area (EEA). The CE marking certifies that a product has met EU consumer safety, health or environmental requirements.
- **Electromagnetic compatibility (EMC) tests** - indicates if a product has been tested / approved against unintentional generation, propagation and reception of electromagnetic energy with reference to the unwanted effects (Electromagnetic interference, or EMI) that such energy may induce.
- **QoS** –Quality of service is the ability to provide different priority of voice and data flows, or to guarantee a certain level of performance to a data flow, ensuring immpeccable delivery of voice communications in an IP network.
- **Voice Sound Quality (VSQ)** – is a voice quality feature found in Norphonic telephones, treating the sound so that it is heard extremely clearly even in noisy ambient areas.
- **Noise Reduction** - is the process of reducing noise in a communications signal.
- **Self Monitoring and Fault Check** – is a feature in Norphonic telephones, allowing the telephone to carry out automatic health-check and fault sensing and communicate this, thereby improving uptime and performance whilst reducing maintenance work.
- **PABX hotline** / **Hot-line** – describes the feature where a hotline is immediately connected when the handset is lifted.
- **Autodial on handset lift** – describes the feature where the telephone will automatically dial a number when the handset is lifted, thereby eliminating the need for the user to remember a telephone number when in distress.
- **Armoured Stainless Steel Cord** – description of a Norphonic telephone cord (vandal proof).
- **Braille** - Braille system is a method that is widely used by blind people to read and write, invented by Luis Braille in 1822 and used on many telephone keypads worldwide.
- **Modbus** – (UDP open protocol) enabling the remote access for status monitoring and control, for example link status, handset on/off and monitoring the condition of telephone components. Comes as standard on all Norphonic telephones.
- **SNMP** - Simple Network Management Protocol, is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention.
- **LAN** – Local Area Network
- **PABX** / **PBX** / **EPABX** - A private automatic branch exchange (PABX) is a telephone exchange that serves a particular business or office, as opposed to one that a common carrier or telephone company operates the general public.
- **PSTN** - The Public Switched Telephone Network (PSTN) is the network of the world's public circuit-switched telephone networks, in much the same way that the Internet is the network of the world's public IP-based packet-switched networks. Originally a network of fixed-line analog telephone systems, the PSTN is now almost entirely digital and includes mobile as well as fixed telephones.