Experts in fire protection

Fire protection solutions for wind turbines

BRANCH SOLUTIONS

WIND TURBINES

From fire risk to investment risk

In recent years the use of wind energy has become established with high growth rates and good prospects for the future. Simple rotors have become more and more powerful high-tech power stations. Nowadays the design of new performance classes plus their offshore locations require a high level of investment – and the protection of the investment against interruptions in operation and even total loss. Up till now manufacturer, operator and fire brigades have been helpless when dealing with the risk of a fire.

The nacelle, the heart of wind turbines (WT), contains generators, gears, brakes, switch cabinets, transformers and converters, and so represents a especially high fire risk.

Risks

- Business interruptions or total loss of the wind turbine with all the economic consequences for operator, manufacturer and insurance.
- Damage to image and uncertainty among investors and the general public.

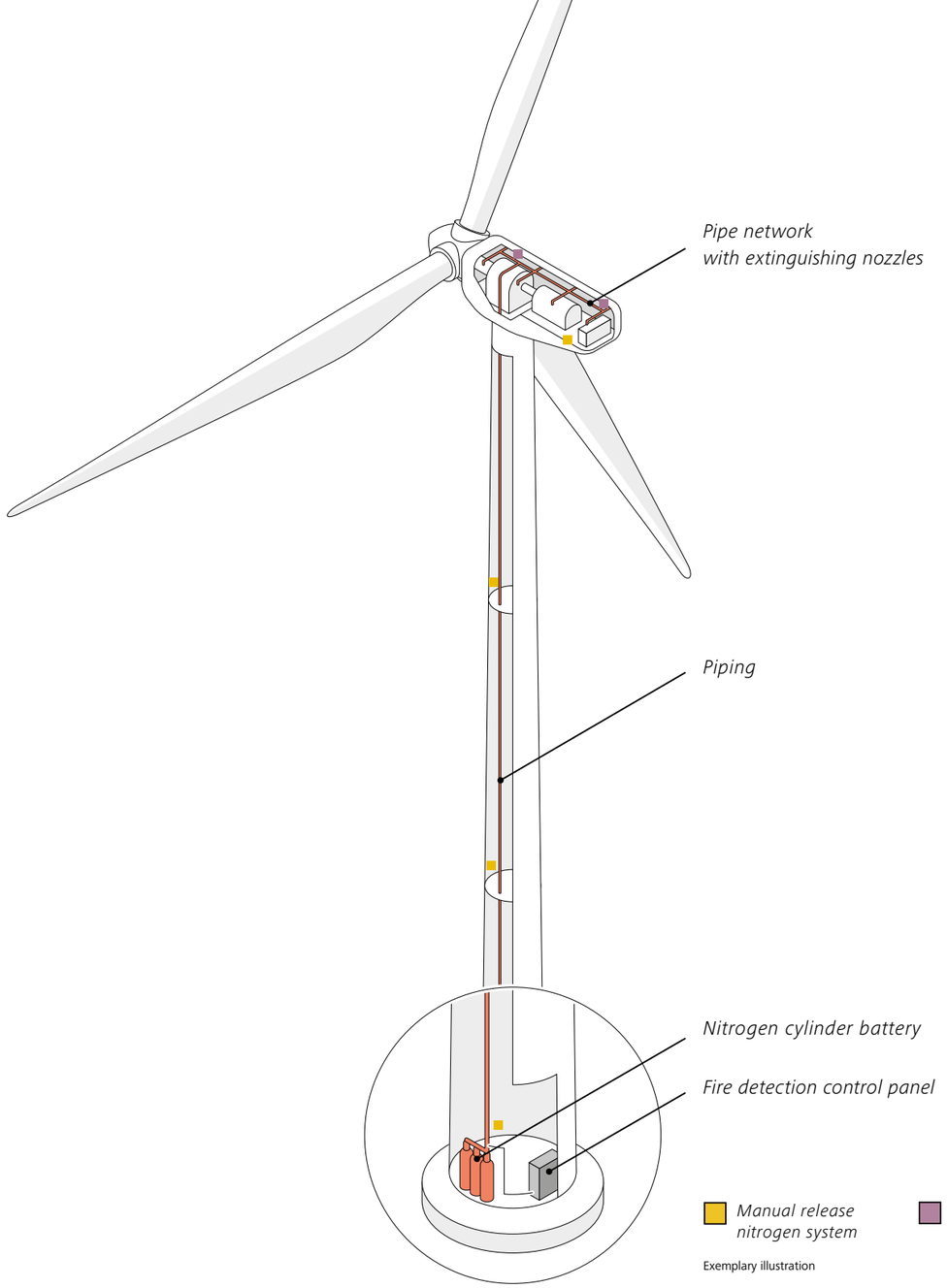
Fire protection

If a fire starts as the result of overheating of components, electrical faults or a lightning strike, the fire will find plenty of combustible material in the form of mineral oils, lubricants, plastics and electronic components.

Long response times, poor access routes and the extreme hub height of modern wind turbines: Access to the fire source as a must for successful extinguishing is rarely possible for the fire department, particular when normally fire ladder systems only reach to a height of about 30–50 m.

If components in the nacelle ignite, further spread of fire can no longer be prevented, with total loss of the wind turbine often being the result. Fire fighting by the fire department is therefore mainly limited to just control burning off.

And with offshore facilities any outside help would in any event arrive too late.



Exemplary illustration

Minimax fire suppression for wind turbines

Minimax has worked with proven and tested components to develop effective protective solutions for wind turbines – both for retrofitting in existing towers and for installation in new facilities. In doing so the special challenges, such as permanent vibrations and extreme temperature gradients, were taken into account.

The protection schemes were realistically tested in our own research center in a 1:1 test for their suitability for practical use.

When you are deciding which of the protection schemes developed by Minimax is the appropriate solution for your wind turbine, our competent engineers are here to advise you.

Phased approach – modular construction

Regardless of whether it's sprinkler systems, gas suppression systems, fire prevention systems or fire detection systems, Minimax can draw upon its own unique range of tested and certified components and systems from its own development and production facilities. Our six-stage fire protection scheme has proved itself for decades, especially for wind turbines.

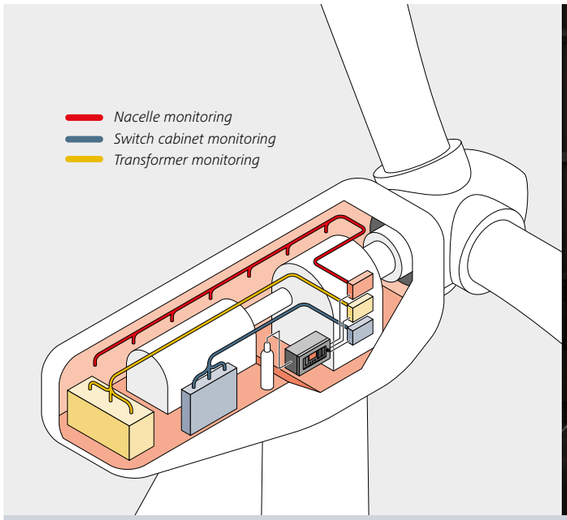
Structural fire protection
Coating the power cables with KBS coating prevents the spread of fire along the cables. Cable transits are filled out with KBS Sealbags fire protection pillows to make them fire-resistant and smoke-gas tight. Fire bulkheads on cable transits and on selected tower segments stop the spread of fire.

Module 1

Fire extinguishers
The extinguishing gas carbon dioxide is the only extinguishing agent used in manual fire extinguishers that extinguishes without leaving any residue at all and can even be used with sensitive hardware. CO2 extinguishers are therefore used to protect switch cabinets in nacelle and tower.

The Minimaxol foam fire extinguisher, with its particularly adhesive and resistant foam characterized by a high extinguishing capability on solid and liquid materials, is suitable for the protection of the remaining areas in the nacelle.

Module 2



Fire detection systems with machine shutdown and suppression control
The job of automatic early detection of fires at danger points is taken on by fire gas, smoke or heat detectors. The aim of fire detection equipment is early detection with a high level of false alarm prevention. The particular fire detection equipment used is tailored to the requirements of the danger zone.

As soon as a detector detects a fire, the fire alarm control panel sends a potential free contact to the wind turbine control system, which in the event of an alarm initiated. Visual and audible alarms indicate the the state of danger on site, and at the same time the alarm is forwarded to a "permanently manned location".

For automatic suppression system control the fire detection control panel is expanded with modules for this. These are fitted with redundant processor technology.

If the fire risk is not resolved by switching off the system another detector in the extinguishing zone gives the alarm, the suppression system is automatically activated. Furthermore manual call points for manual release can be installed for each suppression zone.

Module 3

Water mist systems
The water mist system allows the implementation of protection schemes which guarantee the maximum level of safety with a minimal use of water. The water mist nozzles are installed in such a way as to protect system parts such as main bearings, gearing, brakes and generators. So that operational safety can be guaranteed all year round, the water is provided with an antifreeze which allows dependable use in conditions of up to -30 °Celsius. The extinguishing agent is an aqueous solution which is sprayed via special nozzles. The fine atomization multiplies the total area of the extinguishing agent. This efficiently cools the fire source and environment. The evaporation of the extinguishing agent not only binds a large quantity of heat but also hinders the supply of oxygen to the fire source. This results in an additional smothering effect.

The quantity of extinguishing agent released by the Minifog system is so small that as a rule no substantial extinguishing agent retention equipment is required.

Module 4

Technologies used

Inert gas suppression system
The Minimax Oxeo inert gas suppression equipment is an ideal fire protection solution for wind turbines. The inert gas used forces out the oxygen required for a fire, extinguishes quickly and leaves no residue, and is electrically non-conductive. This suppression technology is particularly suitable for local protection of the switch cabinets and encapsulated transformers in the nacelle and tower sections of wind turbines. In the event of fire a predetermined quantity of inert gas is released in the affected areas within a specified interval.

Module 5

Inveron Hazard Management System – Safety at a glance
Inveron from Minimax is a simple and user-friendly system for the visualization and operation of fire detection, fire suppression, and alarm systems. All messages and events from entire wind farms are automatically summarized as a graphic on the screen and this supports you in the implementation of the necessary actions. Inveron enables ideal monitoring of extensive, complex building structures.

Module 6

Advantages at a glance

- Avoids long downtimes and expensive business interruptions thanks to early (earliest) fire detection
- Use of proven and dependable products in compliance with current standards and directives
- Latest state of the art
- Very high level of personal and system protection via fire protection solutions tailored to the type of wind turbine

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