TECHNICAL NEWS

CORTEM GROUP
To be sure to be safe.

April 2015

Emergency lighting systems in hazardous areas

As everyone knows, emergency lighting means illumination designed to operate when the ordinary one is missing. This is one of the main principals of plants safety to allow the evacuation of people in case of danger, or even, more simply, to allow operators, to move, in case of electrical failure and black out.

In systems installed in areas with the presence of a potentially explosive atmosphere, this type of system has several further critical issues compared to a system installed in a safe area.

1. The emergency lighting

The emergency lighting is divided, depending on the purpose, in:

a) reserve lighting;

b) security lighting.

a) Reserve lighting

The reserve lighting allows continuing the activities when the ordinary lighting is missing. It can be used for escape routes and emergency if it meets the relevant requirements.

To provide energy to the emergency lighting systems can be used centralized or distributed energy systems.

b) Security lighting

Safety lighting is expected to allow the safe evacuation of an area or finish a potentially dangerous or vital ongoing process before leaving the room.

The security lighting is subdivided into:

• **lighting of emergency exits and streets**: security lighting that ensures that escape routes are effectively identified and used safely when a place is busy. Safety lighting must illuminate the emergency way so that it can easily be followed up to the emergency exit, which must be easily identifiable.

• **no-panic lighting**: security lighting that works to avoid panic and that allows people to reach the place where the escape routes can be identified.

• **lighting of high risk areas**: security lighting that works for the safety of the people involved in potentially hazardous processes or situations where it's necessary to activate a procedure to end the process for the safety of operators.

2) The regulatory system

The standard to which to refer for a emergency lighting system is the UNI EN 1838, which determines the following minimum requirements:

• emergency lighting must provide a double brightness of moonlight during a clear night;

• security lighting should report the escape routes so that they can be easily identifiable and followed up to the "safe place".

With regard to equipment, however, there is a standard recently published. This is the EN 60598-2-22 "Luminaires - Part 2-22: particular requirements – emergency equipment" whose last revision was published in January 2015.

The standard specifies the requirements for the equipment of the emergency lighting that uses light sources in emergency circuits with power supply voltages not exceeding 1.000 V.

Obviously, with regard to explosion protection, standards will be those referred by the ATEX Directive 94/9/EC, depending on the type of protection adopted.

3) The centralized and distributed energy systems

The main issue we intend to develop in this technical article concerns the difference of lighting fixtures power systems of the in the case of loss of power from the network.

The emergency power supply systems can be divided into two major categories structurally different:

• centralized systems;

• distributed systems.

Centralized emergency systems ensure to feed all the utilities of a plant from a single point, while the distributed systems are located in all the plant. A system with a high degree of distribution has a source of emergency power supply dedicated to each user.

From these definitions we can draw two extreme cases:

- Light systems powered by normal electrical distribution but with own energy storages.

- Light systems with a single centralized power source (UPS or rescuer) connected to a low voltage plant, which powers in continuity all the points of use.

Further these two extreme positions, there are a number of possible alternative solutions with different degrees of centralization/distribution systems of electric power relative to the users.

The main advantage of the distribution system with its own energy reserve derives directly from the distribution. The systems are less sensitive to possible failures or openings of protections that may occur in the electrical system. In addition, installation is particularly easy and flexible, but the maintenance and control of the efficiency is particularly expensive.

Until now, for systems installed in danger areas for the presence of a potentially explosive atmosphere, was usually adopted the distributed system. Lighting fixtures, with its own independent UPS, composed of inverters and batteries mounted in the same enclosure (usually with ‘Ex d’ protection), were installed at defined points of the plant, so that to ensure lighting in case of black out.

This distributed system has the advantage of not requiring a specific line of power supply, but the enormous disadvantage of having very expensive light points: the maintenance costs of the individual inverters and, especially, of the power batteries are very high.

It should be held in account also the great difficulty of designing a safe inverter/battery system that must be mounted in a flameproof enclosure, which must not be itself, a possible source of gas emission.

4) The technological innovations for Ex areas: the LED technology

The use of LED technology applied to explosion-proof lighting fixtures allows today to design systems with lighting fixtures supplied at low voltage (24 V - 48 V).

In this case, it's possible to design centralized emergency lighting systems with a UPS positioned in Safe Area and one or more low voltage power supply lines which feed the individual lighting fixtures positioned in classified areas.

This system avoids all the maintenance costs of the lighting fixtures located along the system, which will be virtually eternal thanks to the useful life of LED lamps and thanks to the fact that a emergency lighting fixtures is used for a few hours or for a few minutes in a year.

The maintenance will focus on the central UPS, which, situated in safe area, will not present particular problems.

The standards to be referred to in this case will be the following:

• EN 50091-1-1 "General safety requirements for UPS in operator access"

• EN 50091-1-2 "General safety requirements for UPS in restricted areas"

• IEC 50171 "Centralized power systems."