Electrical installations in hazardous areas: places for batteries recharge

Industrial activities which use rechargeable batteries are more and more.

Batteries usually used are with nickel-cadmium or lead and are divided into two groups:

- Traction batteries, mainly used in forklifts, machinery for the cleaning of large rooms etc...
- Stationary Batteries which are used for auxiliary services of power plants, telephone exchange or places where it's necessary to keep in operation machineries also in case of power blackout.

These batteries are usually recharged in reserved areas or in ordinary indoor places. Of course, during the charging operation, they emit a certain quantity of gas (hydrogen and oxygen).

Thereby, these places must be classified in accordance to EN 60079-10 standard for the categorization of hazardous areas with presence of gas.

Batteries lifetime and their gas emission depend on the recharge method. VRLA (Valve Regulated Lead Acid) batteries, defined in many ways on the commercial documentation (recombination, sealed, airtight, maintenance free), are regulated with valves.

There are two types of chargers:

- charger not adjusted: a device that provides a simple charge with voltage and current not constant and in which the current decreases automatically with time, following the evolution of the battery charge;
- self-regulated battery charger: a loader which continuously monitors the state of charge and suspends the recharge when the correct amount of electric power has been provided. It provides only a minimum overloaded in the event that it's connected to a fully charged battery.

Chargers are commercially available with different charge profiles depending on the different recharge stages.

As we wrote, during the activity of recharge, a battery emits a certain quantity of gas (hydrogen and oxygen).

The amount of gas emitted is very variable and depends on:

- the type of cell (Lead, Nickel-Cadmium);
- construction technology (valve regulated battery or open cup);
- profile of charging (IU, IUI, etc...);
- charging stage.

Gas emission depends on the charging current and, therefore, it's greater during a boost charge compared to the float charge. A certain emission of gases is present also during the equalize charge.

EXTENSION OF THE HAZARDOUS ZONE

These gas emissions, for each cell of a battery regulated by valves, spread from the safety valve forming around the valve itself a potentially dangerous zone.

In order to understand the extension of this area you can refer to:

- EN 50272-2 standard relevant to stationary batteries. It depicts a method for the calculation of classified area extension. The extension is usually of some decimeters, based on the notion of hypothetical explosive volume.
- EN 50272-3 relevant to traction batteries. It indicates, conventionally, an extension of the area of 0.5 m.

These assessments take account of any malfunction of the charging system or of battery cells. These two standards are useful, along with EN 60079-10 standard, to classify exactly the danger zone.

VENTILATION CONDITIONS

As per any dangerous area, its extension depends also on ventilation conditions and it will be minor in external environment compared to internal environment.

Concerning this aspect, it's necessary to underline that in environments where the batteries are recharged you must still provide good room ventilation.

We have seen that all the batteries emit, more or less, a certain quantity of gas and there's a difference of emission depending on the battery construction.

However, there's a difference in the emission frequency depending on the intended use of the battery: traction batteries or stationary batteries.

In fact, the traction batteries, often of the type open cup, are discharged and recharged periodically (typically every day) and, hence, produce gas emission daily.

The ventilation systems of batteries rooms can be realized with artificial ventilation or natural ventilation.

A good solution is to realize a system of artificial air extraction in correspondence of each battery by means of a special hood. This allows confining in the best way the area where there's a gas emission and, with a suitable extraction range, to reduce the potentially explosive area a few centimeters around the vent openings, even under the most severe recharge conditions.

Normally, in stationary batteries rooms and in small locals for traction batteries charging is used a general room ventilation without the utilize of hoods. A ventilation of this type can be realized with an artificial extraction system or with a natural ventilation. In any case, the ventilation range should be sized on the basis of the total flow of gas emitted from all the batteries present.