Classification of areas with presence of dusts

In the last newsletter, we have analyzed the danger of explosion due to the presence of combustible dust.
In this newsletter, we will take a look to the classification of hazardous areas due to the presence of combustible dust, according to the provisions of the new rules which, as we shall see, come directly from the IEC international standards acquired by CENELEC and by the national regulation.
The danger of explosion, as we saw in previous newsletters, can occur not only in places where gas, vapors or mists are present and where are normally used electrical installations that follow European regulations in force for over thirty years. It can occur also in plants where dust are machined during the normal operation and that might create a dangerous atmosphere, which could cause an explosion.
As we have seen, the danger is much less intuitive, since they are substances that are not normally considered dangerous, such as wheat flour or sugar, but that under certain conditions, can cause devastating reactions…

Recently, the picture of Standards has changed from the past and the CENELEC amended the set of regulations for the hazardous areas classification due to the presence of dust and for the design and construction of plants in these areas.
The current rule for the areas classification is the EN 60079-10-2:2009. This rule replaces the previous Standard EN 61241-10, which still remains valid until the 01/06/2012.
This rule derives directly from the international standard EN 60079-10, thanks to a process of a complete international harmonization.
One of the differences from the previous legislation is the definition of combustible dust. According to the EN 60079-10-2 standard, combustibility can be confirmed through laboratory tests, based on the EN 60079-20-2 standard, which is currently in an editing phase.

The procedure for the areas classification, which involves for the first time the process experts, is based on three steps:

1. Identify if the material is combustible, according to its own characteristics which are: the particle size, the moisture content, the minimum ignition temperature of the cloud and the electrical resistivity. Thanks to these parameters is defined to which group the dust belongs. The groups are:
    a. Group IIIA for combustible particulate;
    b. Group IIIB for not conductor dust;
    c. Group IIIC for conductor dust.
2. The second step consists in identifying where containment of dust or dust emission sources may be present.
3. The third step consists in analyzing the possibility that the emission sources could issue dust.

The features of dusts combustion are similar to air-gas mixtures ones and explosive limits are established in the same way. The main difference is that the shape, the size of the particle and the surface / mass of the particles influence greatly the combustion.
In any case, the ignition energy for the combustion of combustible dust is much higher than that required for gas.

Also in this case, the standard EN 60079-10-2 is based on analytical assessments that consider some principles such as the amount of dust in the environment, the thickness of dust layers, the residence times of the mixtures during the year, the degree of emission of sources.

At the end of this analysis, every dangerous place must be classified in one of the following three zones based on the frequency of formation and retention of an explosive atmosphere:

ZONE 20	A place where an explosive atmosphere due to the presence of dust in the form of a cloud in the air is present continuously, for long periods or frequently.
ZONE 21	A place where an explosive atmosphere due to the presence of dust in the form of a cloud in the air is occasionally present during normal operation.
ZONE 22	A place where an explosive atmosphere due to the presence of dust in the form of a cloud in the air usually is not present during normal operation but, if it occurs, will persist only for a short period

Practically, we can consider:

Zone 20: the conditions occur in containers, silos, pipes and containers.

Zone 21: this area may include places closed to points of emptying and filling and places where dust layers can generate an explosive concentration of mixtures of combustible dust and air during normal operation.

Zone 22: this area may include places closed to equipment, protective systems and components containing dust from which dust can escape forming deposits (e.g. milling rooms where dust escapes from the mills and then settles).