



Explosive dust aspiration and filtration systems in metallurgical sector

Presentation of three realizations in metal working

Application 1: special metals grinding

The company is one of the most important producers of metal wool and fibers that are marketed in the main European and world countries. The reference products are metal based: composites of steel (including stainless steel), copper, brass, bronze, zinc and aluminum wool.

The company contacted Tecnosida[®] because, in a specific production plant site in Poland, there had been problems related to fires, explosions and emissions that were incompatible with the regulations.

Gallery

Tecnosida[®] **immediately** prepared the necessary procedures to inspect and perform a technical analysis of the situation, from which it was evident that the explosive events were related to the production technology used. Grinding the material required for manufacturing the final product meant creating sparks (the source of ignition). The resulting dust was considerably explosive and prone to spontaneous ignition, facilitating the deflagration phenomenon.

Previous solutions implemented by other companies:

- Initially a cyclone dust collector was used to treat the emissive flow. However, tests revealed that this technology did not guarantee atmospheric emission;
- The second attempt was to place a bag filter to remove the dust. This solution was found to be unsuitable since the bags frequently caught fire, even though they were made of fireproof material, compromising the production plant's operation;
- The third solution used a wet fume treatment system. The following problems were immediately encountered:
 1. difficulties in separating the wet matrix from the residues;
 2. caking and incrustation of the filler material;
 3. problems with disposal of the mineral lubricant used for cutting.

ATEX dedicated plant for the treatment of explosive powders

The nature of the dust requires a completely safe treatment for the emissive flow to prevent fire. On the basis of the previous solutions adopted but found unsuitable, Tecnosida[®] designed a dedicated suction and dedusting plant, compliant with the ATEX directive and suitable to definitively solve the problems described above. It was necessary to design a settling system that

could automatically detect and extinguish sparks, in addition to another system for evacuating the flow from the production process in the event of a considerable amount of sparks.



Specifically, by analysing the production process it was found that all the elements that contribute to the development of fire were present, including:

- fuel: represented by the compounds resulting from the production process, (zinc stearate, aluminium, etc.)
- comburent: oxygen in the dust extraction air
- ignition source: sparks created by grinding the material

During the testing phase, Tecnosida® set up the safety and fire/explosion prevention systems and, after carrying out the technical tests on the pilot plant, it was found that the emissions were lower than required by the standard. Moreover, this system ensured the continuous operation of the plant thanks to the effectiveness of the prevention system adopted.

Once the excellent results had been confirmed, the customer commissioned us other four equivalent exhaust systems.



The main elements of the system, appropriately sized and designed for specific productions lines, were:

- 1 Dustdown[®] bag filter complete with breaking panels and shutter system with non-return valves, compliant with the ATEX standard requirements;
- Decantation system with automatic spark detection and extinguishing for prevention;
- Flow extraction system, as an additional security;
- Electrical/mechanical panel for plant control;
- Centrifugal fan with motor and belt transmission

Tecnosida[®] has built and executed with its own technicians 100% of the installation of the plant at the customer's site (located in Poland) and supervised the activity through the internal technical office.

Tecnosida[®]'s ultimate goal was to ensure that the emissions met the standards in force to conserve the internal/external environment in order to reduce the environmental impact of the processes.

Application 2: welding and metal processing

The customer is a company particularly attentive to technological innovations that for decades has been operating in the production of heating and air conditioning systems. Depending on the needs of different customers, it is able to offer boilers and burners of different models and with different characteristics. The company supplies its products to final consumers and other companies and, over the years, has also specialized in the production of solar systems and panels.

The production of such a wide range of products is carried out also through internal activities

such as cutting - welding and, in general, metal processing. These operations involve the emission of pollutants that are harmful to the operators and the surrounding environment. Tecnosida® has been contacted to solve the problem related to the emission of fumes deriving from metals welding operations (aluminum) in various workstations (7-8 positions). Given the potentially explosive nature of the pollutant, the customer requested the introduction of certain safety equipment in compliance with the European ATEX directive.

Cartridge filter for the treatment of aluminum powders and fumes

Tecnosida® accepted the request and carried out a first technical inspection, with the aim of highlighting the critical points represented mainly by the explosive nature of the treated product (aluminum) that generates highly explosive powders and fumes.

To solve this problem, Tecnosida® proposes the construction of a suction and filtration system to be placed at the service of six operating stations (four of which works in contemporary), a repair position and four welding zones. The proposed solution is hinged on three points:

1. First phase: dedicated design of collection points located on the various welding stations. It is carried on through the construction of hoods in galvanized sheet appropriately sized according to the geometry of the different machines. The use of these hoods allows to suck the pollutants directly at the source and then they are conveyed to the filtering system by means of special pipes;
2. Second phase: the polluted air aspirated by hoods is conveyed inside a self-cleaning cartridge filter, made of thick carbon steel sheet and positioned outside the shed. It is equipped with a special valve and is able to filter fumes and dust emitted during the production process;



As requested by the customer and in accordance with the European directive on potentially explosive atmospheres, ATEX equipment was introduced in the design, such as:

- breakage panels made of stainless steel and placed on the cartridge filter as safety element: they are able to guarantee the safety of the operators and the protection of the surrounding environment in case of explosion;
- non-return safety valve: located in the conveying pipe, it prevents the propagation of a possible explosion inside the suction system
- centrifugal fan in non-sparking ATEX execution

Application 3: grinding and recovery of old appliances

The customer is part of a worldwide operating group that deals with the recovery and recycling of metals, paper, chemicals, hazardous electrical/electronic waste and trading on raw materials. The site where the plant was installed carries out the recovery of materials from products such as refrigerators, computers and televisions.

On the grinding line of disused refrigerators, the company presented a problem of high production of powders, also of aluminum, which represent a potentially explosive element. The customer contacted Tecnosida® to solve this problem and, moreover, it required the modification of the existing pneumatic conveyor system for previously selected materials (aluminum, copper and brass) with the aim of further separating and recovering the products indicated above.

Cyclonic separator and bag filter for explosive powders treatment

Tecnosida®, following an adequate technical inspection, designs a suction and treatment plant that, taking into consideration the explosive nature of aluminum powders, has been realized in

compliance with the European ATEX directive. It is composed of:

1. Suction hoods specially sized for the localized collection of the powders emitted in the various phases of the production process;
2. Connection pipes that convey the airflow captured by the hoods inside the separating cyclone. It represents the first phase of pollutants abatement because, through centrifugal force, it is able to separate coarse metal powders present inside the treated air stream;
3. Dustdown® self-cleaning bag filter for the removal of fine and ultrafine residual powders. It is equipped with an upper chamber complete with sleeve cleaning system, built in sturdy sheet steel, and is realized in the ATEX version to make it suitable for use in potentially explosive atmospheres. It is equipped with antistatic sleeves, ATEX certified valves and breaking panels.

As we have seen, the system and all its components are ATEX certified.

Also the centrifugal fan has been realized in ATEX execution and has been equipped with an anti-sparkle nozzle. On the pipes, as a safety element, a fire damper has been placed: in case of explosion, it closes avoiding the propagation of the flame in the suction line.

Tecnosida® plant was built in compliance with the reference BAT (D.MF.01) and allowed to reduce pollutant emissions, solving the customer's problems.