

Buyer's guide

How to recognise and select a safe dust collector on the EU market

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Explosion risks associated with dust collectors are long known and not nearly negligible. This is because almost all organic, and even some inorganic (metallic) materials are combustible in dust form.

The majority of dust is also hazardous if it comes in contact by inhalation. So, risks to the health of personnel using and maintaining dust collectors are also present.

One should expect that based on the described risks that safe dust collectors could easily be bought off the shelf on the EU market. But is this true? Not necessarily, and clients often need to consider safety aspects when selecting their future dust collector. To make the decision easier, this article reveals some hotspots on which to focus

Explosion Protection

The Role of Documentation & How to Read It

The first way to become familiar with your potential new dust collector will almost always be through its documentation. This can be a long read, so it is good to know how to pinpoint relevant explosion protection data, and what to expect and ask for.

In the EU, the equipment used in potentially explosive atmospheres or 'Ex zones' is controlled by the so-called 'ATEX Directive' (2014/34/EU). The directive covers equipment placed inside the Ex zones, which can produce an ignition source having sufficient energy to ignite an explosive atmosphere. The majority of dust collectors do not have any electrical or movable mechanical elements installed which could act as a potential ignition source. Electrostatic discharges, foreign bodies, or sparks originating from the process could present a risk, but this should be controlled under the ATEX Workplace Directive (1999/92/EC).

If the dust collector, however, requires electronic components (e.g. differential pressure sensors) or non-electrical movable elements (e.g. filter cleaning mechanisms), the manufacturer needs to determine whether these elements are placed inside Ex zones and able to produce an ignition source. Attached through a flexible hose, differential pressure sensors are almost never in contact with dust. Moreover, movable mechanical elements are often recognised as benign under standard EN ISO 80079-36 "Non-electrical equipment for explosive atmospheres." Dust collector manufacturers, however, need to consider the ATEX Directive when the explosion protection cannot be ensured only through the control of ignition sources. In this case, additional protective measures are required, e.g. explosion suppression. Autonomous systems intended to halt or limit the effect of an explosion will in this case fall under ATEX, but not necessarily the entire collector assembly.

There have been many misunderstandings how the ATEX Directive applies to dust collectors. For this reason, a number of different interpretations and applications can be found on the market. This is luckily now clarified very well in ATEX 2014/34/EU Guidelines (3rd Edition is now current), Section §243.

As developed above, the majority of dust collectors will never fall under ATEX. But, does this mean they can be blindly placed on the market without any requirements for explosion protection? Not nearly. These dust collectors will need to demonstrate a state-of-the-art level of explosion protection under other EU directives. Most often this will be the Machinery Directive (2006/42/EC), where explosion protection is an important aspect of its essential health and safety requirements.

Now, regardless of the directives applied, the manufacturer should confirm the equipment's safety by issuing an EU Declaration of Conformity and CE mark the equipment. It is a good indication if VDI 2263-6 "Dust fires and explosion protection in dust extracting installations" is mentioned on the declaration, as this means the manufacturer is familiar with the latest safety standards and principles. Indicating EN 1127-1 "Explosion prevention and protection - Basic concepts and methodology" is also encouraged, as the standard offers a basis to perform an explosion protection risk assessment. If the elements covered by ATEX are installed, they shall bear an Ex marking in addition.



TRM Filter's dedusting unit during live explosion tests at the FSA site in Kappelrodeck.

Note, however, that the documentation is only an indicator and does not buy safety. Most importantly, clients should therefore challenge and discuss points of interest with potential suppliers until fully confident in the solutions offered. This is why TRM Filter is highly focused on communication with its clients, encouraging open discussion and demonstrating principles of safety without hesitation.

Building Confidence in Technical Solutions

Before trying to inspire the client, a responsible manufacturer will firstly challenge the robustness of technical solutions in-house. This is usually done by performing in-depth risk assessments, and even more robustly, sometimes exposing the equipment to testing.

Risk assessments can be done by comparing current standards and state-of-the-art requirements with the actual design of equipment. This is suitable for situations where standards and literature are available. Conversely, potential deviations can be evaluated using tools like HAZOP (Hazard and Operability Study) and LOPA (Layer of Protection Analysis), which are well accepted in the process industry. Testing, on the other hand, is beneficial to confirm the conclusion of risk assessments and to test the solutions which cannot be evaluated through theory only. A good example are innovative approaches to explosion protection, where technical standards are non-existent. TRM Filter came across this when designing a dust collector with “internal explosion pressure relief.” Here, an explosion is held on the “raw gas” side of the collector, using the filter element as a flame barrier and releasing overpressure to the “clean gas” side. This system is beneficial, as it requires a smaller footprint for installation and reduces maintenance interruptions and costs in comparison to active systems. During the design, TRM Filter conducted several series of live explosion tests with FSA GmbH. The result of this exhaustive testing process is that TRM Filter has now introduced a dust collector which will withstand explosions with K_{ST} up to 640 bar.m/s, making it suitable for hybrid mixtures and metallic dusts. However, risk assessments and testing can also be applied to identify potentials for optimisation. With such thinking, TRM Filter has been able to demonstrate that without compromising safety, autonomous systems are not required for explosion isolation on specific applications. A butterfly inlet valve is used in lieu, which reduces the total cost of ownership and the possibility of faults.



Primary filter as explosion protection element at ECR dedusting filter system by TRM Filter.

But a client will not see the assessments and reports by default. It should, however, ask the manufacturer to demonstrate that weather equipment has been tested, and how specific risks are controlled. It is also particularly important to understand on what grounds procedures have been carried out. For example, the testing of equipment under ATEX may only be intended to evaluate potential ignition sources, for example by applying EN ISO 80079-36 “Non-electrical equipment for explosive atmospheres.” In contrast, live explosion tests are in many cases voluntary and will be done beyond this, usually in accordance with EN 14460 “Explosion resistant equipment” and sometimes EN 15089 “Explosion isolation systems.” So, one should not mix the two.

Containment

Explosion protection aside, protecting workers against hazardous substances is also of significant importance. This is especially relevant due to light speed development of new chemicals, with nearly 300 registered in the EU each year.

Dust collectors with a large amount and often unknown mixture of materials should therefore be dealt with significant caution. Fortunately, there are solutions to enable this, gathered under an umbrella term “containment.” For dust collectors, this mainly covers systems for safe replacement of dust containers and filter elements, e.g. Bag-In/Bag-Out (BiBo), Push-Push Filters or Continuous Liner Systems (CLS). TRM Filter has developed and extensively tested a series of dust collectors with high-end containment solutions. It has been proved that these collectors can provide robust and friendly-to-use protection for substances with extremely low OELs, even below $1 \mu\text{g}/\text{m}^3$ (OEB 5).



Dedusting filter system type ECR by TRM Filter with central dust collection and continuous liner in pharmaceutical application.

These concentrations are well below visible limits, so again testing is the only way to determine the suitability of the design. For this reason, it is important that the client knows how containment solutions have been tested and their margin of safety.

Conclusions

It is clear from the examples presented herein that the client should be asking focused and technically challenging questions when selecting its future dust collector. This approach is the only one that enables the recognition of safe and technically appropriate equipment beyond nicely written documentation. This, of course, can sometimes be time- and energy-consuming, but brings a result worth the effort.

To assist clients with this, TRM Filter is investing significant effort to develop and issue concise and customer-oriented product information, demonstrating the safety characteristics of their dust collectors. TRM Filter is also ready for a discussion at any time should this be necessary to grow confidence in solutions offered.



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Established in 1982, TRM Filter is based in Ljubljana, Slovenia. The company focuses on the development and production of innovative pharmaceutical dust removal systems in the domains of pharmacy, chemistry and food industry. Rotatronic Technology developed by TRM Filter meets the high requirements for explosion-protected High Containment filter systems, offering the best filter performance while also being low-maintenance. TRM Filter's solutions are implemented by leading pharmaceutical companies. The company is run by Peter Tomšič.