vicoma
Consultancy & Engineering

ATEX

Explosion-proof designs, installations and operations

Vicoma improving connections

Vicoma has been bringing people and knowledge together to improve processes and installations for over 60 years.

ATEX

Vicoma supports companies in providing explosion-proof (ATEX) designs, installations and operations. Are you looking to design, expand, modify or zone an installation in a potentially explosive atmosphere? Vicoma Consultancy & Engineering has extensive experience in the practical application of ATEX directives in a wide range of industries. This includes the food and beverage industry as well as the chemical, oil, gas and steel industries.
We are happy to offer companies our support.

What is ATEX?

Components or systems intended to be installed in potentially explosive areas are required to comply with ATEX directives, where ATEX stands for ATmosphères EXplosibles. There are two ATEX directives that describe the minimum safety requirements: ATEX 114 (2014/34/EU) and ATEX 153 (1999/92/EC).

Equipment

ATEX 114 is the directive for devices and systems intended for use in places where there may be a risk of explosion.

Workplace

ATEX 153 describes the minimum requirements for improving the health and safety of workers who may be at risk due to explosive atmospheres.

ATEX-certificates

Because explosions can cause such enormous damage, it is important to ensure that components, systems, installations and working environments comply with ATEX directives. For this reason, there are a number of explosion protection certifications that can be obtained to demonstrate knowledge and skills on explosion protection. A few key certifications are listed below:

IECEx 002	Zoning and classification
IECEx 003/006	Electrical design
IECEx 007/008	Inspections
IECEx 009	Engineering
IECEx 012	Explosion protection document
IECEx 016	Ignition source analysis

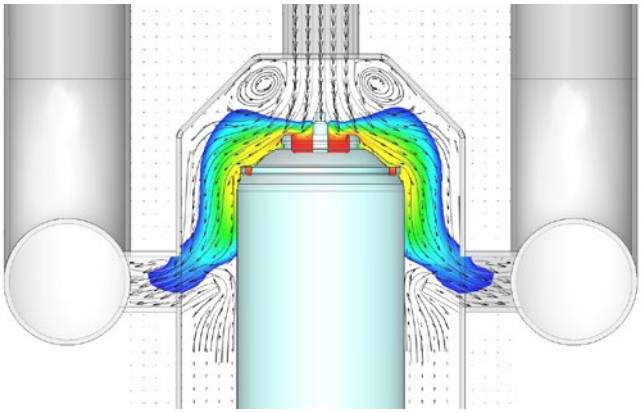


Figure 1
CFD simulation of ventilation effect on explosive gas cloud.

Expertise

Vicoma's engineers are trained and certified in the EX modules above, among others, and are able to guide companies through the practical application of the ATEX 114 and ATEX 153 directives. Tasks range from consultancy studies to complete ATEX zoning for new plants. But it also includes building technical verification dossiers, performing ignition source analyses or preparing explosion protection documents (EVDs), with the associated technical and procedural measures to comply with the ATEX directives.

Vicoma can carry out ATEX zoning based on the Dutch Code of Practice (NPR-7910-1/-2). But this can also be carried out according to the international guideline (IEC 60079-10-1/-2) for companies that are more internationally oriented.

The following lists some of the services offered by Vicoma:

→ Consultancy – Preliminary study, Advice & Feasibility

We know from experience that ATEX studies are often carried out after the concept engineering is already complete. However, conducting a preliminary ATEX study before a project starts can save significant costs at the equipment and component levels. This is made possible through making smart designs and decisions at an early stage in your project. Decisions regarding the type of ventilation, the position of reactors with the associated inlets/outlets as well as locations for pressure relief are particularly interesting to consider during the preliminary process. The zoning can be adjusted to the specific situation. Areas with more instrumentation, equipment or operators can be placed in lower zoning classes through smart design choices. As a result, less stringent measures are needed which in turn lead to cost savings, more efficiency and safer operations.

→ Zoning and classification (IECEx 002)

Vicoma can carry out ATEX zoning and classification according to the Dutch directive NPR 7910-1 (gas) or NPR 7910-2 (dust), or the international standard IEC-60079. Ventilation or inertisation according to NPR-CEN-/TR 15281 can be applied to determine the final zoning and classification.

→ Ventilation dilution analysis (3D cloud)

Applying proper ventilation is an important topic in ATEX environments. If the emission rate of the ATEX release source exceeds 10 g/s, simulation software is a reliable means of determining the size of the ATEX cloud. Pressure-protected release points, stacks or scrubbers can have high emission rates (>10 g/s) in particular. Another reason to use simulation software is to determine the optimal location of ventilation points in a building, for example, when large systems or installations block the flow of ventilation air. This software makes it very easy to see how ventilation flows move through a building. The software Vicoma uses for this purpose is CFD (Computational Fluid Dynamics). Vicoma's engineers use this to reliably map air flows so that the right measures can be taken to ensure safety.

→ ATEX inspection (IECEx 007/008)

Before a plant or factory can be started up, all of the ATEX components must first be inspected. This is called the 'initial ATEX inspection' or the 'detailed inspection'. We can inspect ATEX items for clients on a range of aspects such as cable connections, correct classification, possible damage, proper installation and background calculations (such as Exi calculation). We carry out inspections according to IEC-60079-17 (2024). We can also carry out periodic inspections, such as 'visual inspections' or 'close inspections'.

→ Explosion protection document EVD (IECEx 012)

An explosion protection document is mandatory for any installation in an ATEX environment. This document describes where the ATEX zones are located, what the risks are, as well as all risk mitigation measures and special rules for working in the ATEX zones. It also contains the specific background calculations and information of all ATEX substances present. ATEX zones may exist where gas, dust or hybrid mixtures are present. Additional safety margins are required for hybrid mixtures as this may affect explosive properties such as LEL, UEL, MOT, MIT and temperature class. If required, Vicoma can provide the explosion protection document.

→ Calculation of explosion resistance

When designing equipment such as reactors and vessels, an explosion resistance calculation is needed to demonstrate that the equipment can handle the explosion force in the event of an explosion. We perform the calculations using the FEM methodology according to NEN 14460. We can also perform explosion hatch calculations according to NEN 14491 to demonstrate that they have sufficient capacity in case of a dust explosion.

Avoid unexpected costs with a preliminary ATEX study

Conducting a preliminary ATEX study in the early stages of a project can save significant costs later on.

Example 1
Biogas plant

In the initial phase of the project, the installations were plotted on the site of the factory. This included a margin of 10 metres, taking into account the ATEX guidelines and based on experience and common sense. Only was only in the later detailed engineering phase that it emerged that a gas cloud with a 20-metre radius would be created during blowdown. This put a non-ATEX installation and an office unit 10 metres into the ATEX zone.

How can this be resolved?

Making the office unit ATEX compliant given the non-ATEX compliant zone proved impossible. This resulted in the entire plant needing to be redesigned. In the end, relocation proved to be the best and safest option. All of the main components were placed in different positions in the new design, resulting in a lot of new design calculations. These recalculations could have been avoided with a preliminary ATEX study.
This preliminary study provides insight into the ATEX sources, where they come from, how big the ATEX zones will become and what possible solutions are available to reduce them. This is a relatively small investment in the preliminary stage that results in a great deal of cost savings later in the project.

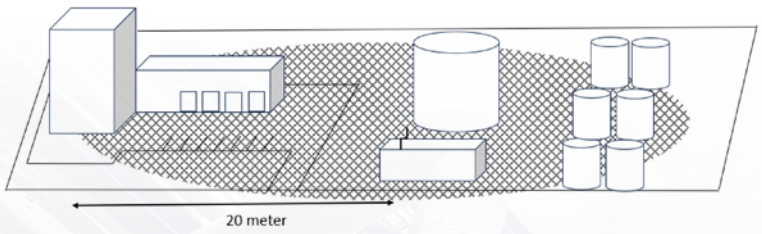


Figure 2
The image shows a site with several installations and an office unit. The shaded zone shows a 20-metre radius around the biogas plant within which the generation of an explosive gas cloud is possible. As this zone was not recognised until a later point, the office unit and another installation were then located in the hazardous zone.

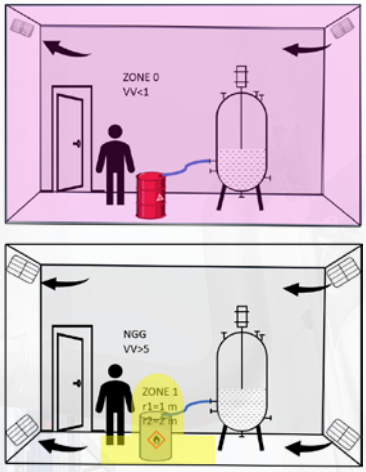
Example 2
Reactors en ventilations

In a confined space, there is a reactor vessel to which a container with flammable substances is connected every day (primary source). This room is equipped with ventilation grilles, but they are small, and ventilation is limited as a result (ventilation rate VV<1). According to the guidelines, a stricter zone classification is required, where the entire space would be classified as zone 0 *(see Figure 3)*.

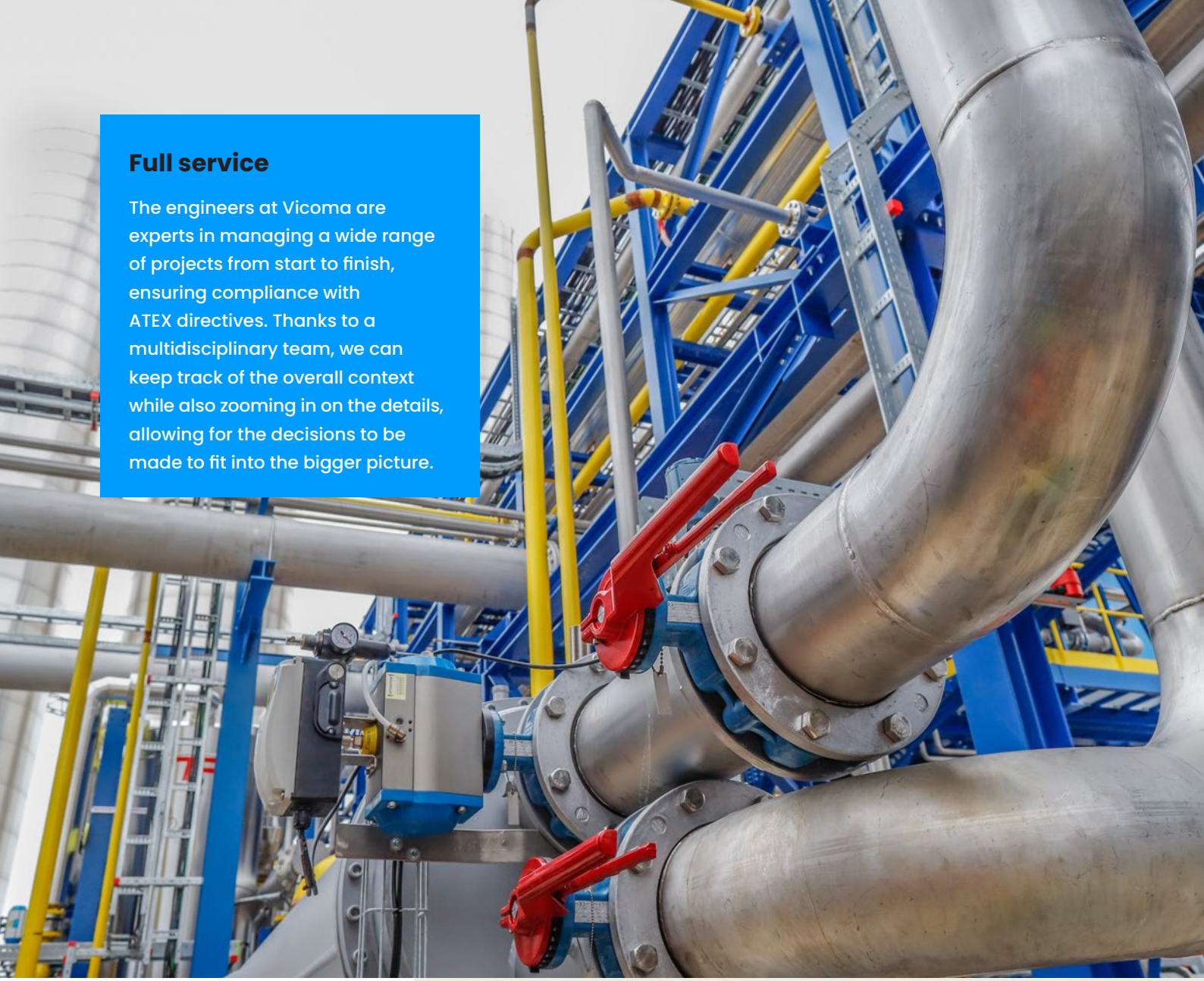
How can this be improved?

By applying larger ventilation grilles for improved ventilation (VV larger than 5), the room can be classified as local zone 1 *(see Figure 4)*. This then leads to a safer working environment as well as cost savings.

This is just one simple example. If ATEX zones are only determined at a later point in the project, it is often no longer possible to make adjustments to the design such as the locations and/or capacity of fans or relocating reactors. A preliminary ATEX study allows companies to make strategic choices and save costs while also increasing safety.



Figures 3 and 4
The images show how zone 0 is changed into local zone 1 by increasing the ventilation rate.



Full service

The engineers at Vicoma are experts in managing a wide range of projects from start to finish, ensuring compliance with ATEX directives. Thanks to a multidisciplinary team, we can keep track of the overall context while also zooming in on the details, allowing for the decisions to be made to fit into the bigger picture.

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Consultancy & Engineering

An innovative, flexible, and independent Consultancy & Engineering firm

Our consultancy and engineering firm has been working for 60 years with a wide array of clients on single and multidisciplinary projects. What can you expect from us? A pragmatic and flexible approach.

Our engineers are capable of overseeing diverse projects from start to finish, handling the engineering aspect efficiently. We also operate swiftly with flexible teams and streamlined communication channels. Being an independent family-owned business, it's inherent for us to prioritize your interests alone. As such, we are not publicly listed and are not tied to specific contractors.

Vicoma Sales
Middenbaan Noord 210
3191 EL Rotterdam
Mailbox 63, 3190 AB Hoogvliet
Netherlands

Call us:
+31 (0) 10 416 00 11

Email us:
info@vicoma.com

www.vicoma.com
We serve 150+ customers in 5 locations in the Netherlands and India.