# ATEX – Explosion Protection at any Price? Maximum Protection with Minimum Additional Investments

X. Knöpfle, B. Bass, A. Riley

In the past few years explosion prevention has become ever more important in manufacturing. Although it is true that the proper measures are available to prevent devastating accidents, it is also true that oversized dimensioning of these protective measures can increase costs severely and unnecessarily.

## 1 Introduction

Despite general acceptance thereof, the growing importance of the EU Directives for plant safety are responsible for a growing uncertainty in decisions concerning the theoretically possible and the practically necessary and sensible measures for specific applications.

Following directives must be observed:

- Machinery Directive 2006/42/EC
- EMC Directive 2004/108/EC
- ATEX Directive 1999/92/EC and others.

Far too much money can be spent far too quickly on potentially dubious measures.

Every plant operator, no matter whether he intends to build a new plant or to continue operating his old one, is obliged to perform a risk analysis of his plant as specified by the Machinery Directive.

*X. Knöpfle, B. Bass, A. Riley*
*m-tec mathis technik gmbh*
79395 Neuenburg
Germany

Corresponding author: *Bernhard Bass*
E-mail: bernhard.bass@m-tec.com

Keywords: explosion protection, mixer design, ATEX directives, plant safety

**Tab. 1 Zones according to their risk potential**

| | | |
|---|---|---|
| Gas | Zone 0 | an area in which an explosive atmosphere caused by a mixture of air and flammable gases, vapours, or mists is present at all times, over long periods, or frequently |
| | Zone 1 | an area in which normal operations may occasionally give rise to an explosive atmosphere caused by a mixture of air and flammable gases, vapours, or mists |
| | Zone 2 | an area in which normal operations do not normally or only very briefly give rise to an explosive atmosphere caused by a mixture of air and flammable gases, vapours, or mists |
| Dust | Zone 20 | an area in which an explosive atmosphere caused by a cloud of combustible dust and air is present at all times, over long periods, or frequently |
| | Zone 21 | an area in which normal operations may occasionally give rise to an explosive atmosphere caused by a cloud of combustible dust and air |
| | Zone 22 | an area in which normal operations do not normally or only very briefly give rise to an explosive atmosphere caused by a cloud of combustible dust and air |

## 2 Explosion risk analysis

If flammable or potentially explosive products are used, the operator must also perform an ignition risk analysis as required by the ATEX Standard EN 1127-1 : 2007. The operator must then integrate the findings of the ignition risk analysis directly into the explosion protection document that must be drawn up for his plant.

The explosion protection document includes:

- A list of the flammable or potentially explosive products used, including the product data sheets
- An assessment of the explosion risks and a list of the derived and implemented countermeasures (ignition risk analysis)
- A description of organisational measures, for example the definition of responsibilities and competences, including the generation of work instructions etc.
- A definition of the areas in which flammable and potentially explosive products are stored or transported, and the subdivision of these areas into zones according to their risk potential.

In a nutshell, the explosion protection document lists the fulfilment of the requirements of the ATEX Directive 1999/92/EC. The implementation of the directive is regulated by the respective Countries' Ordinance on Health and Safety at the Workplace.

Since the drawn up explosion protection document serves as the reference for the plant builder and component supplier, the plant operator should generate this document in close collaboration and consultation with competent ATEX support. This support can be either in-house (if available) or an external service provider, for example the plant builder or component supplier. It is particularly important to work closely with the plant builder and ATEX support in the concept phase when it is still possible to steer away from the high cost theoretically feasible solutions and solve ATEX problems with technically practical state of the art measures. This


**Fig. 1 Yellow EX triangle for users**

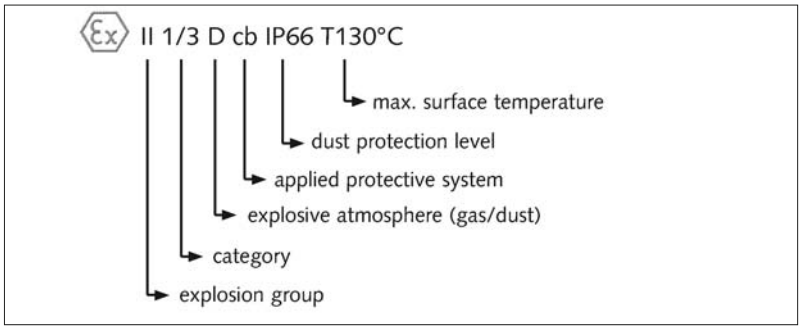


**Fig. 2** Example of ATEX labelling on machinery

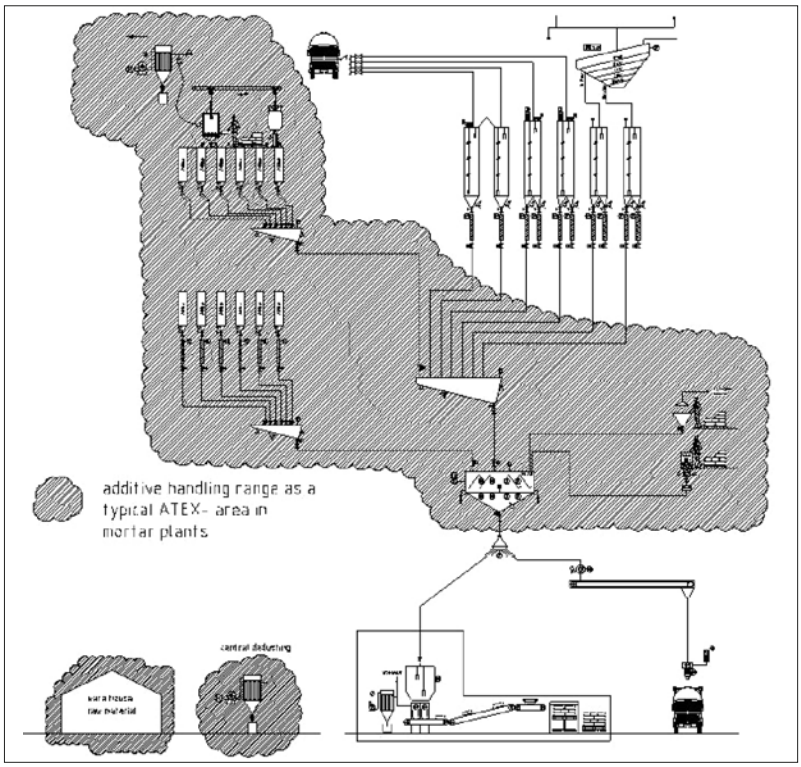


**Fig. 3** Plant design with ATEX areas in a dry mortar plant

approach reduces the investment and subsequent running costs to acceptable levels.

In plants for the bulk material industry the most important zones are the zones 22, 21, or 20 in the category dust. All designs for mechanical apparatus and plant installations for use in Zone 20 involve considerable additional costs because they must be subjected to a prototype test or individual approval by a "notified body", for example the German safety inspectorate *TÜV*. For this reason it is always important to examine whether small changes in operations or the machine installation itself can avoid Zone 20 classification without any fundamental change to the production process.

**Fig. 4** Yellow EX hexagon for makers

## 3 Ignition risk analysis

The same applies to the ignition risk analysis. Here the focus must be placed on the prevention of ignition sources. This way it is generally possible to avoid major structural redesign, which would otherwise entail shock and pressure resistance and other cost intensive measures.

Primary explosion protection: prevention of potentially explosive atmospheres

Secondary explosion protection: prevention of ignition sources

Tertiary explosion protection: implementation of design measures.

The *m-tec* company provides competent and qualified support as a plant builder and component supplier during the whole planning process and even for the initial concept study. For projects requiring consultation with a notified body m-tec works directly with the *TÜV Süd*.

It became clear early on from the provided product data sheets that our mixer project with *RHI AG* of Leoben, a renowned refractory products manufacturer, required extensive ATEX protection even as far as structural design measures. In a dialogue with the customer, a process analysis was conducted on the basis of the product data sheets and the production process plan.

The findings of this process analysis provided the basis for the explosion protection document the customer issued for the mixer section. Due to the processed products, which included aluminium powder, the necessary measures included not only the prevention of ignition sources, but also design modifications – in this case pressure- and shock-proof installations. The frequency of the arising explosive atmosphere meant that the mixer had to be designed for Zone 20 (inside) and Zone 22 (outside).

This clearly defined the requirements for m-tec as the manufacturer of the mixer as set out in the Explosion Protection Directive 94/9/EC (Directive on equipment and protective systems intended for use in potentially explosive atmospheres).

Machines for these ATEX requirements must be subjected to individual approval, or as is the case with m-tec, must pass a prototype test by a notified body, for example the German safety inspectorate TÜV.

This prototype test certification means that this model of m-tec mixers can be used without restriction for future projects with high ATEX requirements provided they correspond to the approved designs.

## 4 Forward planning with ATEX

Some types of raw materials are generally critical concerning ATEX; this applies in

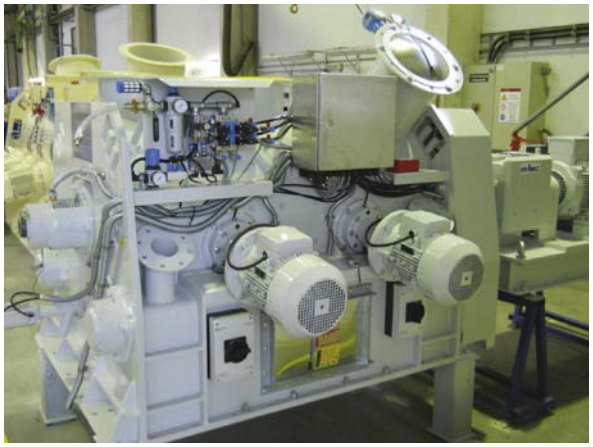

**Fig. 5** This model of m-tec mixers (back view) can be used without restriction for future projects with high ATEX requirements

**Fig. 6** ATEX mixer front view

particular to additives and fibres. For this reason, a number of devices, for instance the m-tec FIBERDOS fibre dosing system, are manufactured exclusively in accordance with the ATEX Directives and can be quickly certificated for use in Zone 21/22 with most fibres without undue delays in delivery.

## 5 Summary

Successful ATEX planning requires detailed knowledge of both the 1999/92/EC Directive and related Standards. It is important for ATEX projects that the plant operator collaborates closely with ATEX competent personnel, either in his own workforce or with external service providers. A plant operator must include the plant builder and component supplier in the design process.

This is the only way to fulfil the ATEX requirements using the state of the art technical solutions without unnecessary investments in dubious solutions.

# Next issue refractories WORLDFORUM 2011

The international trade fair quartet **GIFA, METEC, Thermprocess** and **Newcast** will kick off in Düsseldorf/DE on 28 June 2011. Under the motto "The Bright World of Metals" the topics foundry technology, metallurgical technology, thermal process engineering and cast products will again be at the focus of global attention.
Companies that exhibit at GIFA, METEC, Thermprocess or Newcast can benefit from a special section in refractories WORLDFOROM issue 3/2011, which will be dedicated to this extraordinary quadrennially event.

Editorial Deadline: 13.04.2011
Advertising Deadline: 16.05.2011
Publication Date: 14.06.2011

**www.refractories-worldforum.com;**
**www.thermprocess.de;**
**www.gifa.de;**
**www.metec.de, www.newcast.de**


**Contacts:**

*Corinna Zepter* (Advertisement Manager)
Phone +49(0)7221-502-237
Fax +49(0)7221-502-4237
E-mail: zepter@goeller-verlag.de

*Isabelle Martin* (foreign)
Phone +49(0)7221-502-226
Fax +49(0)7221-502-4226
E-mail: i.martin@goeller-verlag.de

*Patricia Iannelli* (foreign)
Phone +39-0332-240285
Fax +39-0332-280900
E-mail: iannelli@goeller-verlag.de