



**ICCECIP 2023**

*Options for implementing explosion  
protection in critical infrastructure*

**Norbert Daruka PhD.**

**Training Manager**

***Óbuda University, Bánki Donát Faculty of Mechanical and  
Safety Engineering, Hungary***

*5<sup>th</sup> International Conference on Central European Critical Infrastructure Protection  
13-14 November 2023 / Budapest, Hungary*



# Objectives

- 💣 Introduction
- 💣 Fire Triangle
- 💣 Protection
  - priority
  - secondary
  - tertiary
- 💣 Zone
- 💣 Conclusion





# Introduction

## Potentially explosive industrial areas

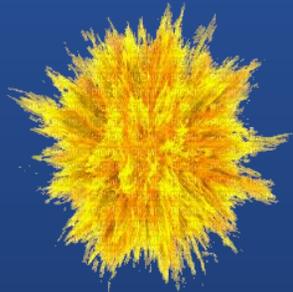
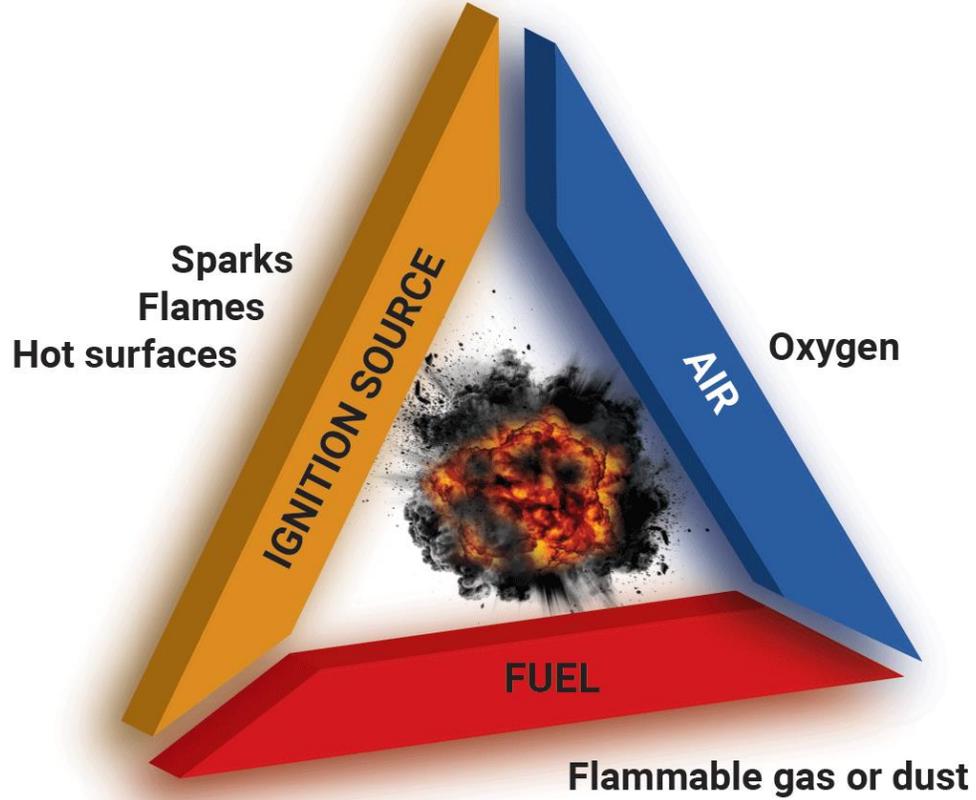
- 💣 Chemical plants
- 💣 Gas pipeline networks and gas distributors
- 💣 Airports
- 💣 Power plants
- 💣 Ports
- 💣 Painting plants
- 💣 Oil refineries
- 💣 Cement plants
- 💣 Food processing plants
- 💣 Woodworking
- 💣 Plastic granulate plants





# Fire Triangle and Dust Explosion Pentagon

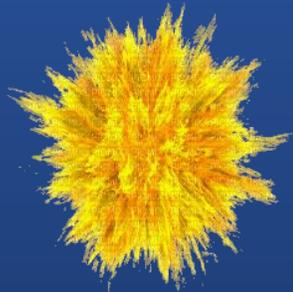
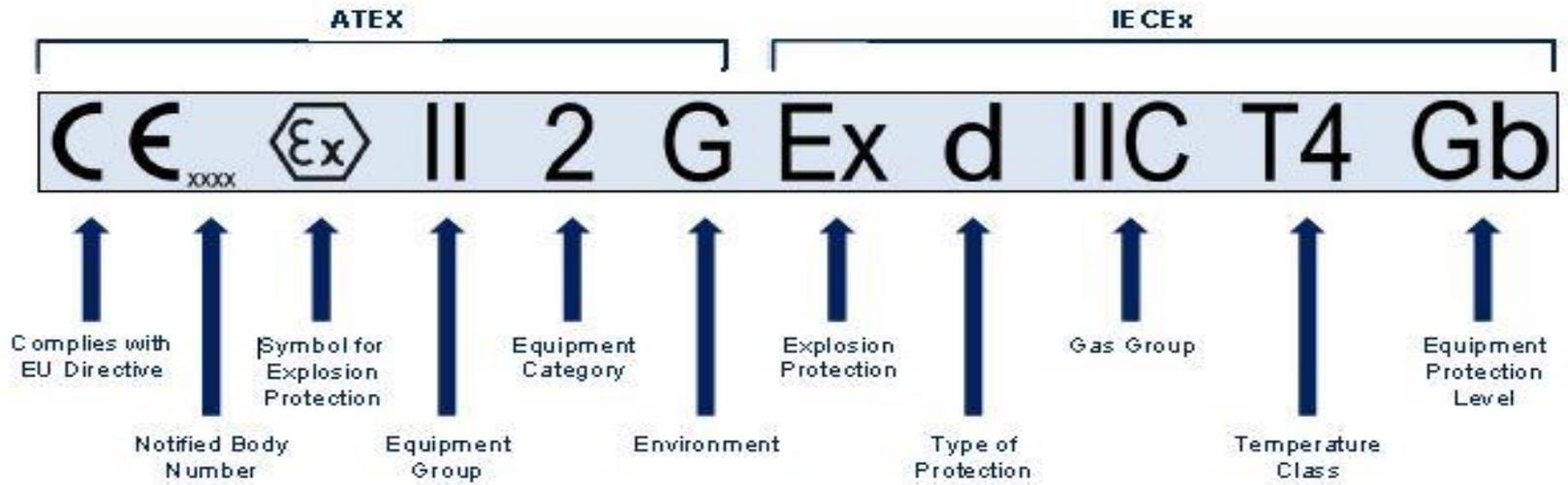
All it takes is one missing ingredient!

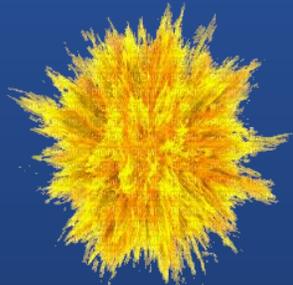




# Protection priority

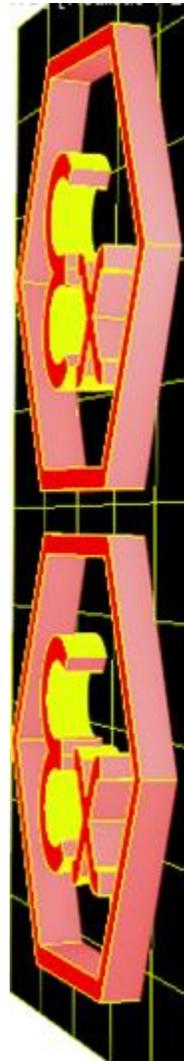
substituting or excluding substances





# Protection secondary

Exclude possible ignition sources



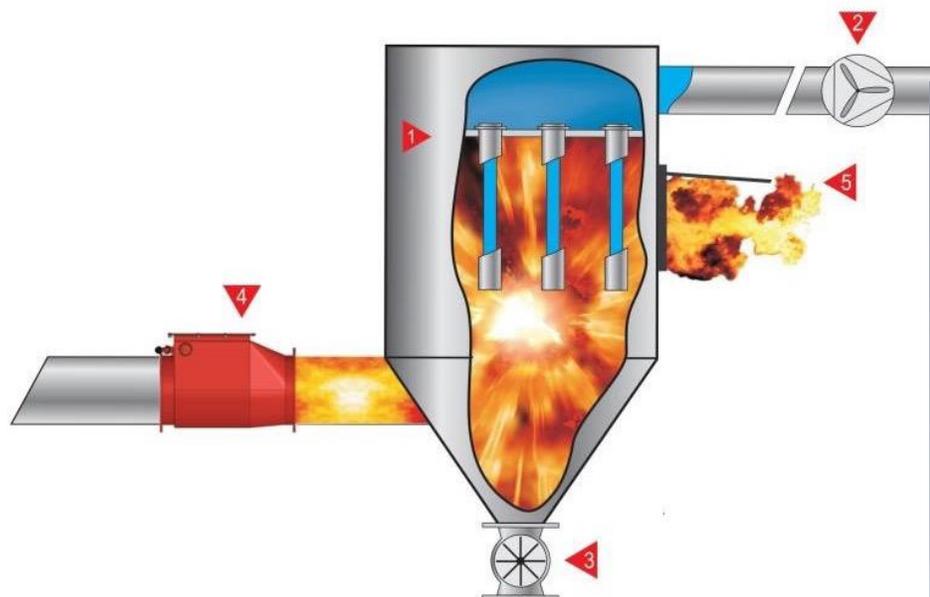
1. hot surfaces;
2. flames and hot gases (including hot particles);
3. mechanically generated sparks;
4. electrical source;
5. stray electric currents, cathodic corrosion protection;
6. static electricity;
7. lightning;
8. radio frequency (RF) electromagnetic waves from 104 Hz to  $3 \times 10^{12}$  Hz;
9. electromagnetic waves including optical radiation from  $3 \times 10^{11}$  Hz to  $3 \times 10^{15}$  Hz;
10. ionizing radiation;
11. ultrasonics;
12. adiabatic compression and shock waves;
13. exothermic reactions, including self-ignition of dust

Effective ignition sources

Potential ignition sources

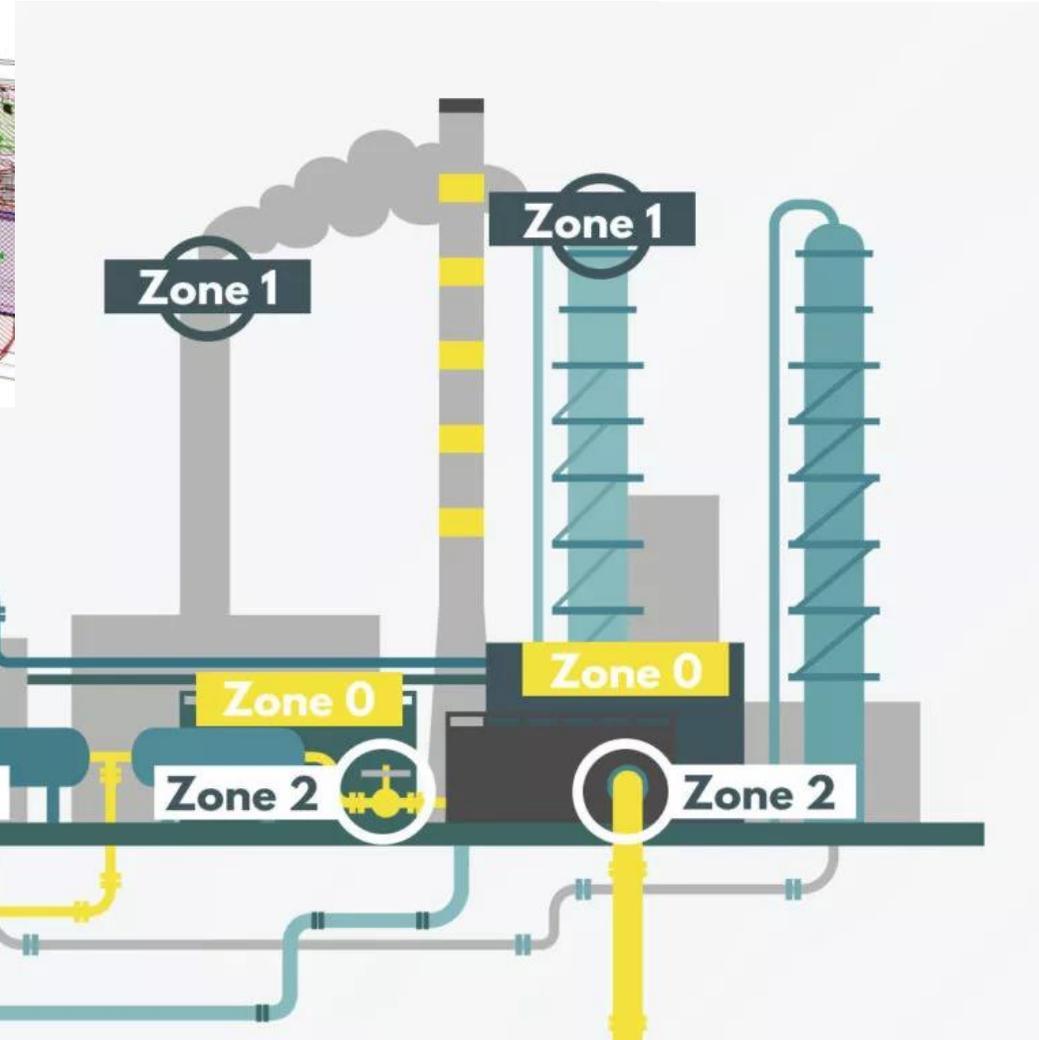
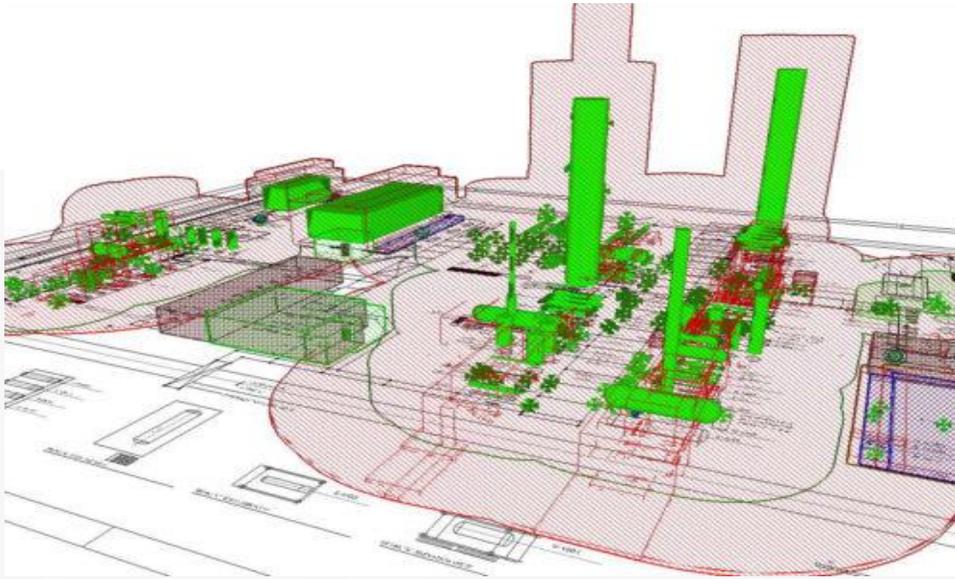
Equipment-related ignition sources

# Protection tertiary

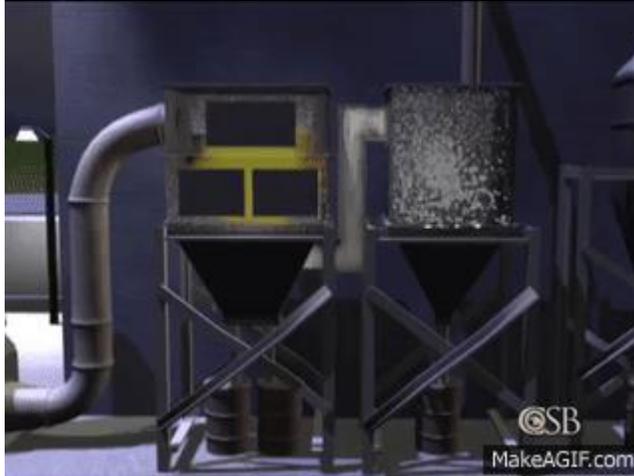




# Zone classification



# Results/Conclusion



≠



there is a difference between an explosion and an explosion

- 💣 Protective use of scientific results is important!
- 💣 The rules must be followed and respected!
- 💣 Safety should never be secondary!
- 💣 A cost-effective solution does not equal a safe solution!
- 💣 Solving one problem (hazard) should not lead to new problems (hazards)!



Classification



Thank you for the kind attention!

*5<sup>th</sup> International Conference on Central European Critical Infrastructure Protection  
13-14 November 2023 / Budapest, Hungary*