

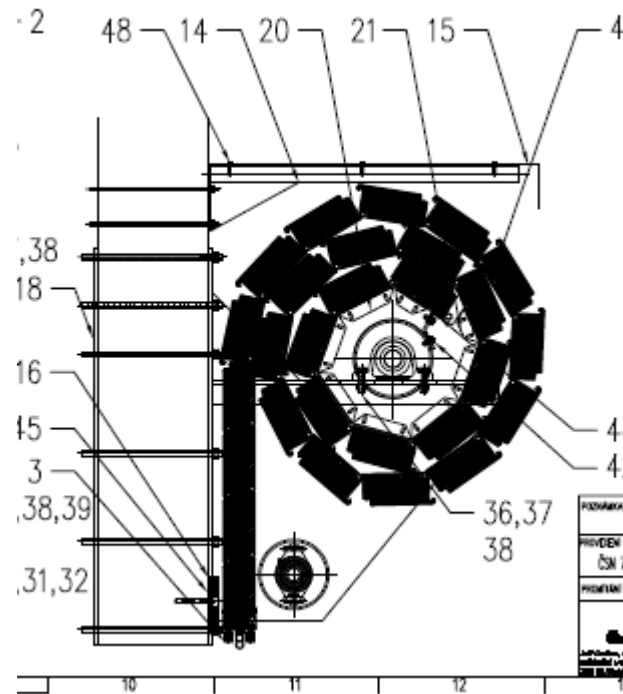
# Construction – Fire-resistant Gates

GEN TRIZ Case Study

# Construction Materials Case Study: Fire Resistant Industrial Gates.

## Problem Description

- Company produces high speed industrial gates for shopping centres and industrial halls. These gates have insufficient fire- and smoke-resistance.
- It is necessary to improve these parameters without cost increasing and deterioration of important design features (size, weight, turning radius, opening/closing time, etc.)

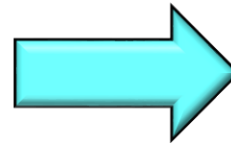


# Construction Materials Case Study: Fire Resistant Industrial Gates. Analysis and Problem Solving

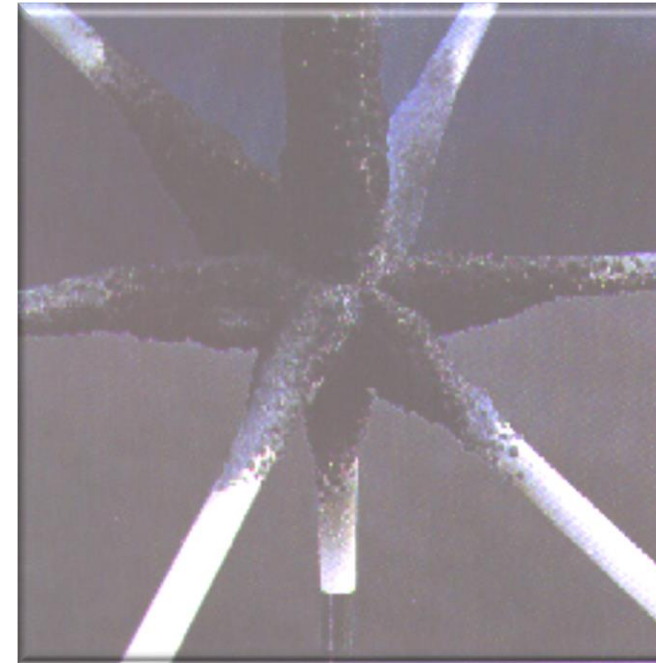
- Physical Contradiction:
  - The gate should be thick to provide sufficient fire-resistance, but it should be thin to be light, compact, fast, and inexpensive
- Physical Contradiction Resolving:
  - It is necessary to separate opposite properties in time: the gate should be thin under normal conditions, and it should become thick in case of fire
- Inventive Principles:
  - Dynamicity
  - Phase Transition
  - Thin Films
- Solution:
  - It is necessary to use a sandwich consisting of 2 layers of metal foil and fiberglass fabric saturated with a intumescent material – e.g. sodium metasilicate,  $\text{Na}_2\text{SiO}_3$  (liquid glass). Under normal conditions this sandwich is thin and elastic, but in the presence of fire liquid glass turns to thick layer of mineral foam. This foam is very fire-resistant. Also it can fill out gaps between the gate and walls => it can stop smoke either.

# Construction Materials Case Study: Fire Resistant Industrial Gates. Solution

Fire test



Result



Steel pipes protected with a thin layer of sodium silicate

<https://en.wikipedia.org/wiki/Intumescent#/media/File:Unitherm.jpg>

<https://en.wikipedia.org/wiki/Intumescent#/media/File:Unitherm2.jpg>