

# Summary

Coincidence or structural incidentalism?  
*A closer look at nine incidents at Chemelot in 2015*



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***This is the summary of a research report by Foundation Crisislab on the question whether the incidents in 2015 on the Chemelot industrial site were coincidental or the result of structural incidentalism.***

Safety is highly valued by Chemelot Site Permit (CSP), as holder of the umbrella permit for the activities on the industrial site of Chemelot.

The year 2015 however was a year that gave reason for questions about the safety on the site. The number of GRIP-incidents (incidents in which the government emergency services are alarmed) was higher than ever before in 2015. A number of incidents caused long-term nuisance for the people living nearby. Therefore there was also a fair amount of media attention and there were even questions posed in the Dutch House of Representatives.

All of this made 2015 a special year in the eyes of CSP and they want to learn from this.

At first sight, the nature of the incidents is completely different. They vary from a large fire or an emission of gas to the tilting of a floating tank roof. Out of its responsibility for safety, CSP asked Foundation Crisislab as independent research institute to find out whether there is a common ground for the incidents in 2015. Formulated differently, Crisislab was asked to find out whether the incidents were coincidental or the result of structural incidentalism.<sup>1</sup>

In consultation with CSP we came to the following interpretation of this question.

- Specifically, we looked at the seven GRIP-incidents and two incidents that were not GRIP-incidents but had a large(r) impact on the surroundings. What does a combining (re)analysis of the analyses that were already carried out by multiple parties teach us?
- A reflection committee has been assembled including representatives both from CSP as well as from the surroundings in a broad sense: people living nearby, local authorities, contractors that work on site and companies that are located on site. The questions that came up in this group are explicitly included in this research.
- As independent researchers, we also extended our conclusions to 'what struck us', such as for example the effectivity of the safety agreements between the companies on site (the 'governance' on site).

The research findings can be summarized as follows. These points will be further explained below.

- Although 2015 was a special year for Chemelot, there is no indication for a trend reversal in the field of safety.
- A more attentive attitude by both Chemelot itself as its surroundings makes that what would previously have been 'events' become 'incidents'.
- Complex and coupled processes predictably lead to incidents, in all industries and in particular at Chemelot.
- There is a tension between safety and production, always and everywhere, but no production also means less safety, because of unemployment.

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<sup>1</sup> Structural incidentalism is the phenomenon that seemingly not coinciding incidents are the symptoms of a deeper cause.

- In daily practice there is a lot of attention at Chemelot for safety with a lower case 's', whereby safety with an upper case 'S' receives too little attention.
- The risk regulation reflex of sincerely concerned managers increases the chance on incidents.
- Safety agreements between companies on the Chemelot site at present do not help to focus on safety with an upper case 'S'.

To be clear, findings 2 to 4 not only apply to Chemelot but to all (chemical) industries.

## Although 2015 was a special year, there is no indication for a trend reversal in the field of safety



Closer analysis of the number of incidents in 2015 suggests that although 2015 was a special year, there is no indication for a trend reversal. The amount of reported unusual events has been practically stable over the last few years. The year 2015 was no exception to this. The number of GRIP-incidents however, has increased over the last years, 2015 being the 'peak year' so far. This turns out to be the consequence of a policy change within the fire department and the crisis organisation of Chemelot to scale up to GRIP faster. Sometimes, the fire department consciously scales up to GRIP 1 in order to inform the government sooner, so that the government can decide what measures are necessary for its inhabitants. This intended improved cooperation with the government means an increase in the number of GRIP-incidents and therefore an increase in media attention.

What made 2015 really special, in combination with the fair amount of media attention, are the following two aspects:

*Long-term nuisance:* Two out of the nine incidents resulted in long-term nuisance: the tilting of the floating tank roof led to a month of odour nuisance for the people living nearby while the pyrazole pollution of the water in the river Meuse led to stopping the intake of drinking water during several months.

*Coincidentally during summer:* This long-term nuisance was enhanced because these two incidents as well as the in principle licensed emissions of PE-powder as a result of emergency stops of the plant that produces this, happened during summer. The people living nearby therefore experienced more nuisance than when this had happened during winter.

Therefore the question remains relevant whether there is a common ground between the incidents that did and do take place.

## More attentive surroundings makes that what would previously have been 'events' become 'incidents'

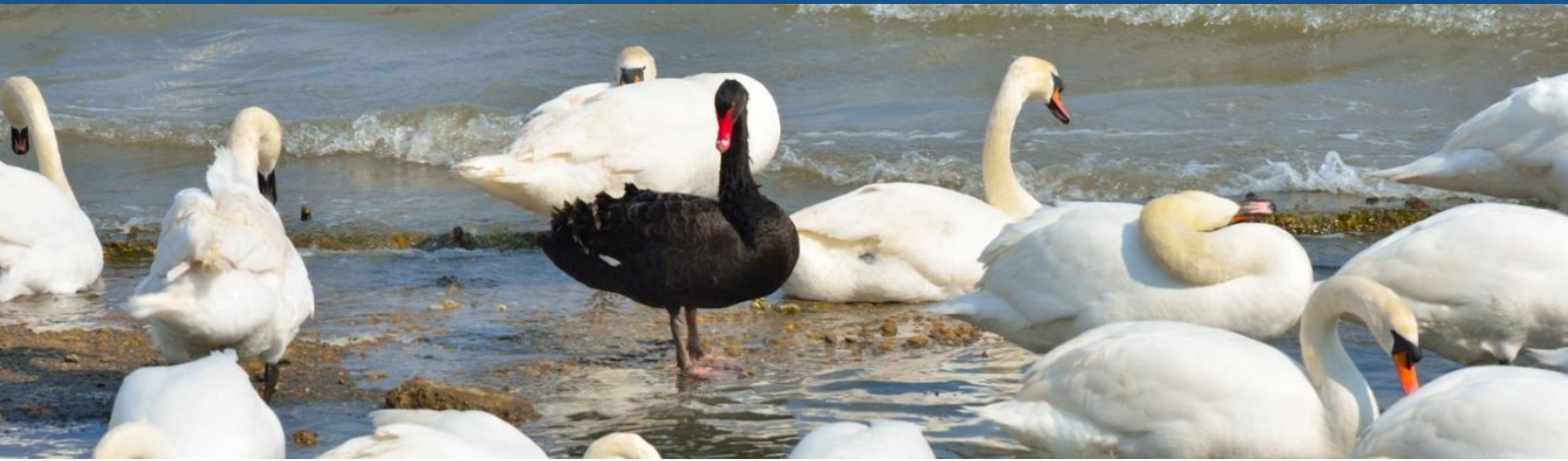


*Norms and measurement capabilities:* A first closer look shows that a considerable number of incidents (four out of the nine investigated incidents) would not have been labelled as incidents only a few years ago. Legal and extra-legal norms become stricter every time while measurement capabilities become more accurate. Events that would not have been noticed by measurement equipment and/or by authorities a few years ago, are now measured and (therefore) qualified as unacceptable. For example, the discharge of pyrazole in the river Meuse is only recently measurable and as a result Chemelot is ordered to prevent this, but there is no reason to assume that this discharge is of recent date.

*Residents living near Chemelot:* It is also remarkable that the reaction to the more attentive attitude of nearby residents itself or at least the perception of it by Chemelot staff leads to incidents: ever since the building of tank 901, the tank caused a limited amount of odour nuisance in the area directly surrounding the tank. Concerns that this odour would reach nearby residents spending time in their gardens during the warmest days of summer in 2015, led to additional ad hoc measures to prevent this from happening. These measures eventually resulted, clearly unintended, in problems with the tank roof and therefore a much more severe odour nuisance during three weeks, which affected the residents that they wanted to protect in the first place.

We conclude that (perceived) more attentive surroundings (norms, measurement capabilities and residents living near Chemelot) sometimes makes that what would previously have been 'events' become 'incidents'.

An over the years equal number of incidents of which a number of small events were 'made' into incidents, suggests that the Chemelot site is increasingly safe. Despite this, real and serious incidents still took place in 2015.



Since the 1980s, academics have known that incidents are ‘normal’ in complex and coupled processes. In this context, Taleb introduced the popular notion of the black swan: there are unpredictable deviations in every complex system, such as a production process or a planning process. While unpredictable before they happen, they evidently can be explained in hindsight.

A modern chemical company is characterized by a complex and internally strongly connected production process that for that reason is able to make the chemical products that society wants. Therefore incidents will be ‘normal’ at those companies no matter what.

More specific it cannot be a surprise that some of the incidents on the Chemelot site came like a bolt from the blue for the people involved, but are, or seem to be, predictable in hindsight. This is explicitly not an accusation of the operators or engineers involved: they are professionals with knowledge about their daily work. Dealing with very rare exceptions cannot be taught.

Complexity not only refers to the ‘hardware’ of the plants but also to the organisation (such as planning, procedures, operating and maintenance) that becomes more and more complex due to efficiency considerations.

This observation has a direct consequence: the entire system of safety assessments of Chemelot, including for example the system of issuing work permits, raises the suggestion that there is an objective measure to (be able to) determine whether activities can be carried out in a safe way. The system of safety assessments offers structured tools for the assessment of safety, but in the interviews, it became clear that the assessment of safety is essentially based on the ‘gut feeling’ of professionals about the situation. This way, while daily work is performed safe black swans will not be recognised.



The easy answer to the question if financial considerations are an underlying cause for the incidents, is of course always 'yes', because if there was no work done at the Chemelot site, industrial incidents would not happen.

In daily reality there has to be production. That is a good thing in itself. Work also means safety, because poverty is large individual risk.

We conclude that efficiency considerations lead to longer periods between turnarounds (as is also true for the maintenance of cars) and these turnarounds therefore become more complex and consequently more sensitive for disruptions. We indeed see that complexity is one of the causes of a number of the investigated incidents.

On the other hand, we did not find any indication that in a situation when a blue collar staff member thinks that something is unsafe, there is pressure from management to continue producing anyway. It rather seems to be the other way around: blue collar staff is well aware of the necessity to produce certain volumes in order to give the plants *raison d'être*.

We see that the management wants to convey an attitude of 'safety first', but in daily practice this is only of limited help for the blue collar staff: after all they have to consider if it is safe enough to produce many times a day. The mantra 'safety first' is not always helpful for them nor is it a basis for a fruitful discussion between blue collar staff and management.

## In daily practice there is a lot of attention for safety at Chemelot with a lower case 's', whereby safety with an upper case 'S' receives too little attention



There is a lot of attention for safety within the investigated companies on the Chemelot site. In the design process of installations many layers of protections are built in, if only for assuring the continuity of production. For daily operating and maintenance work, there is a multitude of procedures prescribed.

However, we conclude that the focus on safety in daily practice is mainly on occupational safety and on the prevention of 'small' unusual events that have to be reported, as said before, according to the environmental permit. This goes to the extent that the prevention of small occupational safety incidents, such as a sprained ankle, receives as much management-attention as the prevention of incidents involving the production processes that potentially have a large impact for the plant as a whole.

We call this safety with a lower case 's' versus safety with an upper case 'S'.

This focus is one of the causes of several of the investigated incidents: measures taken to protect personnel from occupational risks eventually lead to process safety incidents, that potentially had much more extensive consequences.

Therefore, we conclude that, although there is attention for process safety in the design phase, the risks for process safety are sometimes forgotten in the daily practice of dealing with safety. This is also visible in the incidents where inevitably (due to the scale of the activities) less experienced contractors work on site: Chemelot cares more for their personal safety than for the impact of those contractors who lack familiarity with the production processes of Chemelot.





Companies on the Chemelot site automatically take measures after incidents. The management system of Chemelot prescribes this as well: there has to be an incident analysis followed by measures to remedy the identified cause. This automatism is called the risk-regulation reflex.

We used the incident analyses performed by the plants on the Chemelot site as a base for our analysis of the incidents. When studying the different incident analyses, it stands out that there is diversity in approach and depth. In common they have a focus on the incident at hand – not looking broader how often things go well because of the procedures under scrutiny, and in general the focus is on the technical failure or procedures that could have prevented the incident. The recommendations are therefore predictable: technical adjustments and more or better procedures.

However, the measures that are taken based on the incident analyses regularly seem to lead to incidents themselves, because the technical adjustments made daily work more complex and therefore incidents more predictable. Technical adjustments on a pilot operated valve in 1998 eventually lead in 2015 to a contractor making a mistake in the resulting more complex valve system.

## The safety agreements between companies on the Chemelot site do not help to focus on safety with an upper case 'S'



The companies on the Chemelot site work together in a governance structure that on the one hand ensures that the requirements in the permit (CSP) are met while on the other hand sees to extra safety regulations and other practical agreements (management system Chemelot). Discussion with the management of the plants on site gives us two impressions.

On the one hand, respondents argue that they and their 'own' international bosses follow higher standards than the site regulations present, but that it is reassuring that 'the neighbours on site' also have to comply with basic safety agreements. The current governance however does not help to focus on safety with an upper case 'S'. After all, in the site regulations a large amount of safety procedures is prescribed that is mainly focused on occupational safety and continuous technical improvement after each incident.

On the other hand, we conclude that true collaboration between the factories in the field of safety is limited. Plant managers do not address each other on concerns on safety behaviour. The formal authority of CSP towards the participating companies is only applicable for the requirements following from the permit.

Looking at the nine specifically investigated incidents, these would not have been prevented through better agreements between companies or more compliance with these agreements.



The twofold answer to the main question ‘were the incidents in 2015 coincidental or the result of structural incidentalism?’ is

- The year 2015 only appeared to be special; there was no increase in unusual events.
- There are however a number of structural causes that lead to incidents on the Chemelot site.

More precise we summarize the above as follows:

- The year 2015 was a special year, due to the media attention for the high amount of GRIP-incidents that are the consequence of a faster alarm by Chemelot itself and the coincidental occurrence of incidents during the warm summer months.
- A few incidents are in fact the result of a more attentive attitude of the surroundings to the activities at Chemelot or of the more and more advanced technical measurement capabilities. Events that were accepted or unnoticed before, are now labelled as incidents.
- Still there are ‘real’ incidents in which there was truly great danger for personnel on site or for the continuity of the plant. We conclude that:
  - The complexity of the production-, operating- and maintenance processes will inevitably lead to black swan incidents
  - The focus of Chemelot is mainly on occupational safety and the prevention of ‘small’ unusual events, and therefore the importance and risks for the primary production process is sometimes not taken into account, which leads to or enhances ‘real’ incidents.
  - The risk-regulation reflex leads to more complexity of installations and procedures and therefore contributes to more incidents.
- Of course there is continuous balancing between the production interest and safety of production. No misunderstandings: perhaps no production at all seems to be most safe when superficially reasoning, but the resulting unemployment will lead to less safety for the direct environment. Every decision on production or maintenance is and should be made considering whether it is *sufficiently* safe. We do not have any indication that in situations

that are seen as unsafe by blue collar staff, choices are made by management that are less safe out of financial considerations.

- That the above mentioned structural causes were not evident for the companies on the Chemelot site, is at least partly due to the 'positively' technical focus of these companies: management and staff are mainly focussed on taking technical, procedural or organisational measures that are intended to continuously lessen the number of incidents. However, the safety with an upper case 'S' sometimes demands the conscious decision to not do that.