Keynote speech

2022 Mary Kay O'Connor Safety & Risk Conference in October 5-7, 2022

Improving Loss Prevention through alliance between industry, government and science

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Abstract

Although significant incidents are rare, over the last 10 years there has been no further reduction in the number of serious incidents happening at Dutch Seveso companies. Also, there is no further reduction in non-compliance to regulations or in reported unusual events. Weaknesses remain in implementing risk controls.

Despite annual reporting of safety performance up to the level of the Dutch Parliament, and independent investigation of serious incidents, only a minority of people think that industry and regulatory bodies openly, honestly and timely communicate about safety. Lack of trust make people feel unsafe. Action was needed to get to different ways of knowledge sharing and networking to improve performance faster. It would require trust and cooperation between industry and regulators, and support by independent views from science.

The Safety Delta Netherlands (SDN), an alliance between government, industry and science, was created to drive further safety improvement in Dutch Seveso companies through structural cooperation. The ambition is ZERO serious incidents.

Delivering results through such alliances could be challenging. Lessons from earlier programs were taken on board in the design of the SDN. In February 2021 the SDN became operational.

The SDN consists of a knowledge centre and an innovation centre. Work has been done on establishing common goals in a multi-year program, on building capability through networking, and above all on focusing on the delivery of measurable results.

Four themes have been selected as a framework for all activities of the SDN. 'Knowledge collections' are being developed for the current topics of each SDN theme. Networking amongst Dutch Seveso companies is, for example, being stimulated by deploying 'knowledge brokers' and by organising network events. For driving safety innovations research questions have been drawn-up and a top 5 has been selected for converting into projects. With participation of industry, government and science a number of (small) projects from the SDN project funnel are now in execution.

It will take time before people working in Dutch Seveso companies have further improved their risk controls and even more effort is required to systematically deploy available knowledge about it. Ultimately, only through cooperation we'll further improve safety.

Biography Arjan van Dijk

Arjan van Dijk has worked for nearly 36 years with Shell in different roles in Oil & Gas: research in oil processes, refinery operations and management, setting standards for (process) safety and development of programs such as Shell's Life Saving Rules, leading commissioning and start-up of a large upstream facility in Kazakhstan and leading investigations. Since October 2020 is Arjan program director of Safety Delta Nederland, an alliance between industry, scientific institutions and government with the aim to make the Dutch (petro)chemical industry by 2030 the safest in the world and it being recognised as the number one in development and implementation of new safety concepts for dealing with hazardous substances.

Distinguished audience,

I would like to share with you my experience with *Improving Loss Prevention through alliance between industry, government and science*.

Since October 2020 I am leading the Safety Delta Netherlands (SDN). This is an alliance between the Dutch (petro)chemical industry and its chain partners, scientific institutions and the government. The ambition is that by 2030, partly due to the SDN, the Dutch (petro)chemical industry ("its Seveso locations[1]") will be the safest in the world and will have an internationally valued and acknowledged top position in the field of development and implementation of safety concepts relating to the handling of hazardous substances.

In this presentation I'll go into the reasons why the SDN was created and how it will contribute to improving loss prevention. I'll start with the context and then lead up to the creation of the SDN. Next, I'll talk about how we have set it up and I'll conclude with some of the early successes and the challenges ahead.

The context 1 - safety perception by the general public

People want a healthy place to live. They do not want be disturbed by incidents at nearby industrial locations: no smoke, no smell, no noise! Also, they don't want to be exposed to any long term health hazards caused by these locations. They see it as the responsibility of government and industry to make this happen.

An example: in 2019 the Dutch National Institute for Public Health and the Environment (RIVM) investigated the safety perception and information need of people living near a large chemical cluster in the south east of the Netherlands[2]. The study found that a minority (one out of six) felt unsafe. In particular this involved people that live nearby and were not employed by one of the companies of that cluster. These people felt more threatened. Some were looking for information on what to do in case of an incident and wanted to know how they would be timely warned.

Researchers also found that safety perception is related to the level of trust that people have in industry and the regulatory bodies: the greater the trust that they are doing the right thing, the safer people feel. However, only a minority of people thought that industry and regulatory bodies openly, honestly and timely communicate about safety.

Industry and regulatory bodies are transparent about the safety of the Seveso locations. Since 2011 the Parliament of the Netherlands is informed yearly[3] about the safety performance of its industry that is handling hazardous substances. The yearly report gives legislators the opportunity to keep a finger on the pulse and, if necessary, to amend laws and regulations. Also since 2011 every year, a Monitor Compliance and Enforcement[4] for Seveso locations is published by the regulatory bodies. It shows how

[1] Industrial locations that are subject to regulations derived from the Seveso III Directive.
[2] RIVM-rapport 2020-0198 Het peilen van veiligheidsbeleving en informatiebehoeften van omwonenden rond chemieclusters – Belevingsonderzoek Chemelot [in Dutch], https://www.rivm.nl/publicaties/peilen-van-veiligheidsbeleving-en-informatiebehoeften-van-omwonenden-rond, DOI: 10.21945/RIVM-2020-0198
[3] Following a serious incident at Chemiepack, Onderzoeksraad voor Veiligheid, Onderzoek naar de brand bij Chemiepack, 2011 [in Dutch]; https://www.onderzoeksraad.nl/en/page/1571/fire-in-chemical-firm-moerdijk-5-january-2011
[4] Monitor naleving en handhaving Brzo-bedrijven [in Dutch], https://brzoplus.nl/inspectieresultaten/monitor-naleving/

companies comply with regulations. Also the industry[5] publishes safety performance data.

But, sharing performance data is one thing. Giving meaning to it and identifying priorities for further improvement, requires cooperation between these parties.

Perceptions about health and safety risks are strongly influenced by social media, where 'alternative facts' are taken more and more seriously. Incidents often lead to strong societal demand for more regulatory inspections and enforcement and immediate corrective action.

The context 2 - safety performance of Dutch Seveso companies

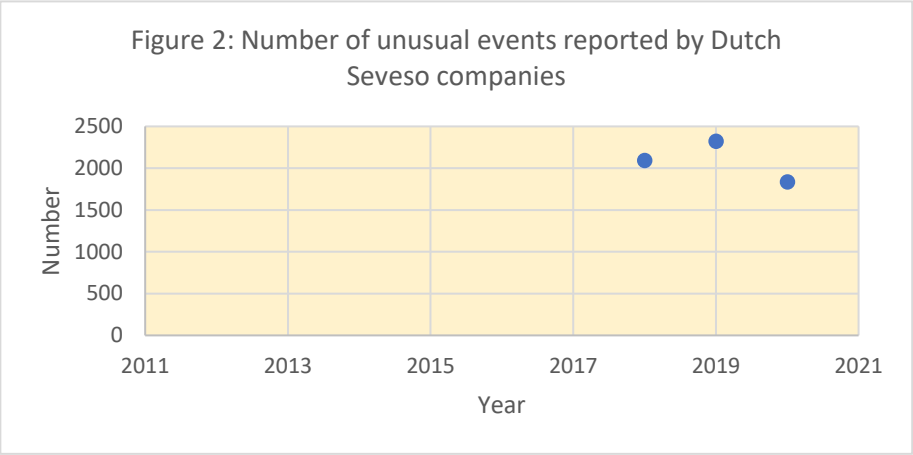
Fortunately, serious incidents are rare. Typically, the Dutch Seveso companies reports about 3 serious incidents[6] every year. See figure 1. These incidents meet the criteria of a "major accident" as defined by Annex VI of the Seveso III Directive (201218/EU) and are investigated by the Dutch Safety Board[7].

Unfortunately, the general public perceives many more incidents[6]. These could be less serious events or even changes in what is seen by industry as normal operation. In 2020 companies working under the Seveso regulations reported a total of 1836 unusual events[6] to the regulatory bodies. See Figure 2. The majority (56%) of these unusual events is about small leaks to air, soil or water. Also flaring (13%), unplanned outages for maintenance (10%) and small fires (7%) are included.

Obtaining lessons learned from these unusual events can help in identifying system weaknesses. For example, analysis by the National Institute for Public Health and the Environment (RIVM) of 17 incidents[8] reported by Dutch Seveso companies for the period 2019-2020 showed that most happened during maintenance, or start-up or shutdown of

[5] Veiligheid Voorop, Annual report 2020, https://veiligheidvoorop.nu/do/download/get/289
[6] Safety Delta Nederland, Staat van de Veiligheid 2020, https://www.safetydelta.nl/sdn_bibliotheek/sdn-staat-van-de-veiligheid-2020-samenvatting/
[7] Onderzoeksraad voor Veiligheid, https://www.onderzoeksraad.nl/
[8] RIVM report 2021-0051, Analyse van incidenten met gevaarlijke stoffen bij Brzo bedrijven 2021 [in Dutch].

an installation. It also showed that direct causes were mostly human factors due to missing or unclear working procedures, or degradation of materials due to weak technical inspections.



Correcting the underlying causes of unusual events will ultimately prevent serious incidents. Better use of available knowledge can help. More effective ways of knowledge sharing and networking can help. Innovations in ways of working can help, in particular when new risks emerge due to the energy transition. Enablers are trust and cooperation between industry and government and independent views from science.

The context 3 – managing health and safety risks by Dutch Seveso companies

Activities involving the handling of hazardous substances have health and safety risks. It is key for sustainable business that society accepts that the health and safety risks to the living environment of people are well controlled. Risks need to become tolerable with well implemented risk controls that are based on good industry practices and inherent safe design.

To safeguard against unacceptable societal risks regulations have been put in place based on the Seveso III Directive. In the Netherlands, some of the standards and guidance on how to implement these regulations have been jointly developed by industry and regulatory bodies. These are the so-called PGS publication series [9].

Inspection of the 400 Dutch Seveso companies by regulatory bodies shows that effective implementation of controls based on these standards could be further improved. On average over the period 2016-2021 there are 4 cases[6] per year with weakly implemented controls and immediate threat of a serious incident. This involved less than 1% of the Seveso companies. Also each year there are about 180 notable cases of control weaknesses, but with no immediate threat of a serious incident. This involved about 25% of the Seveso companies. In addition every year 550 minor non-compliances with regulations are found. See figure 3.

[9] The PGS publication series is a guide for companies that produce, transport, store or use hazardous substances and for regulatory bodies that are charged with the supervision and licensing of these companies, https://publicatiereeksgevaarlijkestoffen.nl/ .

Politicians noticed that over the last 5 years the number of non-compliances to regulations have not demonstrably reduced, despite many safety improvement initiatives, often financially supported by government grants. They called for action[10].

Regulatory inspections sometimes focus on specific themes. For example, managing explosion risks (ATEX), managing the risk of tank overfill (PGS 29 standard) or dealing with ageing of installations. Regulatory bodies select these inspection themes based on signals such as recent incidents, new regulations or trends in earlier inspection findings. These are not necessarily the biggest risks as perceived by industry. Cooperation between government, industry and science can support the alignment of agendas and in selecting focus areas for driving safety improvement.

Establishing the SDN

The lack of performance improvement made government, industry and science explore different ways to further improve health and safety of handling hazardous substances with the ambition of ZERO serious incidents. Earlier efforts suffered from fragmentation and results of earlier efforts often lacked wider implementation. This required a different approach in which structural cooperation between parties becomes the key for success.

From the autumn of 2016 to December 2020, the (petro)chemical industry, science and government worked together in the Sustainable Safety 2030 programme (DV2030) on a vital petrochemical industry without any serious incidents. One of the deliverables of this program became establishing the Safety Delta Netherlands.

In December 2019, parties reached agreement on an action plan for the Safety Delta Netherlands aiming to further improve the safety level of the Dutch Seveso companies through structural cooperation, aiming at the prevention of serious incidents. Parties agreed to focus on the development of (innovative) safety concepts, in the field of hardware, software and mindware, and on the improvement, development and

[10] See for example: Kamerbrief 28 089 nr 184 [in Dutch], https://www.tweedekamer.nl/downloads/document?id=40aa92b4-4c94-4f7b-b511-d8e491af598b&title=Omgevingsveiligheid%20en%20milieurisico%27s.pdf

dissemination of knowledge. The agreement has been the basis for the Safety Delta Netherlands covenant[11] signed October 5th 2020.

The ambition: *the Dutch Seveso companies will be the safest in the world by 2030, and therefore hold an internationally valued and recognised leading position in the development and implementation of safety concepts relating to the handling of hazardous substances*.

Commitments were made on funding a 4-year program with contributions, both financially and in providing expertise, from government, industry (in particular the 'frontrunner' companies) and science.

The involved parties are aware that delivering results through such alliances could be challenging. Lessons from the earlier DV2030 program have therefore been included in the design of the Safety Delta Netherlands. These are:

1. Develop the ambition into concrete and measurable objectives.
2. Segment the target group of Dutch Seveso companies and determine per segment what is needed to improve the safety level in this part of the target group.
3. Build on the projects that have been carried out within DV2030 and stimulate implementation of outcomes.
4. Be selective and only choose projects with the greatest contribution to the ambition.
5. Be selective in setting up decision-making and consultative bodies. Guarantee quality through clear roles and responsibilities.

Most importantly, to become successful it is essential that trust between parties is maintained. Therefore SDN have been working on establishing common goals in a multi-year program, building capability through networking, dealing with each other with integrity while governing the SDN, and above all focusing on the delivery of measurable results.

Approach taken for the SDN

In February 2021 the SDN has become operational. It now consists of a knowledge centre and an innovation centre that are supported by a small program office. There is a central platform, accessible through the SDN website, where knowledge is available and where one can be informed of the latest innovations and knowledge developments. A simple governance structure has been established with representatives from government, industry and science that meets 4 times per year, sets direction and approves the programs.

[11] Formal agreement between the Ministry of Infrastructuur en Waterstaat and Delft Technical University, Rotterdam School of Management Erasmus University, 4TU Centre for Resilience Engineering, RIVM, TNO and the Safety First Foundation. In the Safety First Foundation various industry associations are united to work on safety. Also other parties expressed their support for the agreement: the Ministry of Economic Affairs and Climate, the Ministry of Justice and Security, the Ministry of Social Affairs and Employment, Interprovincial Consultation, BRZO+, the Royal Association of the Dutch Chemical Industry (VNCI), the Association of Dutch Tank Storage Companies (VOTOB), the Association of Dutch Petroleum Industry (VNPI), the Association of Traders in Chemical Products (VHCP), Chemelot Site Permit, the Institute of Sustainable Process Technology (ISPT), COAST and the Faculty of Governance and Global Affairs at Leiden University.

Four themes have been selected as a framework for all activities of the SDN. See table 1. These represent hardware, software and mindware.

Table 1: SDN themes

Theme 1 - Risk | Control | Assurance	Determining safety risks, measures to mitigate them, and ways to assess that these measures are working are strong determinants of safety performance. Current topics: Internal / External Oversight, New Risks, Cyber Safety.
Theme 2 - Safety culture and leadership	Safety culture and associated leadership are strong determinants of safety performance. Current topics: Safety Culture, Safety Perception
Theme 3 - Measuring safety performance and learning from incidents	Measuring is knowing, and learning is the basis for improving safety. Current topics: Measuring Safety Performance, Learning from incidents
Theme 4 - Process Safety - Asset Integrity Management	Specific Safety Management or Asset Integrity Management processes that are highly determinant of safety performance. Current topics: Ageing, Corrosion Under Isolation, Early Leak detection

The SDN knowledge centre

The SDN knowledge centre offers access to knowledge and practical experience in the field of process safety: collecting, networking, and implementing of knowledge.

The aim is to provide easy access to relevant, up to date knowledge to professionals for effective implementation of risk controls at Seveso companies. SDN do not develop knowledge by itself. Expert advice from parties on selecting existing knowledge is sought and then it is made available via the SDN platform (www.safetydelta.nl) in a user-friendly way. SDN aims to expand this platform to a place where people proactively exchange knowledge and experiences.

SDN have started developing knowledge collections for topics associated with each SDN theme. The purpose of a knowledge collection is to offer a limited amount of relevant information. The collections do not strive for completeness. Experts help in making the selection. The collection ranges from informative and educational resources, to practical tools and fact sheets that people who are busy with safety every day can apply to their situation. Collections are tailored towards the needs of specific user groups and are developed in such a way that target groups can quickly find the information relevant to them with the help of smart search functions. SDN monitor its use and expand based on (perceived) needs of users.

Also, through presence in consultation structures of participating organizations the SDN knowledge centre gets informed about the knowledge needs of the industry. SDN acts as 'broker' by connecting parties with corresponding needs and helps avoiding fragmentation of work or repeat work: the same problem being solved in parallel through multiple projects.

Networking amongst Dutch Seveso companies is key for success. The SDN deploys 'knowledge brokers' to engage with them. These are experienced professionals, peers, that visit locations, and can point to available knowledge, or pick up needs for expanding the SDN knowledge collections.

Finally, like any new entity the SDN seek to connect to (potential) users and experts through newsletters, social media, webinars and workshops. For this we recently started the 'SDN on tour' campaign.

The SDN innovation centre

The SDN innovation centre links businesses, science and government to accelerate innovations and create knowledge that will sustainably enhance the safety and competitive strength of the industry that is handling hazardous substances. It provides insight into the developments taking place and brings research and innovation needs and partners together.

In order to initiate and coordinate new research programs, improve and develop existing and new safety concepts, and help find funding sources for these, the innovation centre has drawn up 19 research questions [12] on the basis of individual discussions with frontrunner Dutch Seveso companies, and signatories of the SDN covenant. These research questions were then supplemented and complemented by the Sounding Board Group of the knowledge centre, and the Programme Council and Science Council of the SDN innovation centre.

Subsequently, representatives of the frontrunner companies have set priority to areas where innovations in safety are most desirable for the near term. This resulted in the current top 5 research questions:

1) What knowledge and skills do we expect from the leader, the engineer and the operator in the factory of the future?

2) What are the new safety risks for companies that work with hazardous substances as a result of the energy transition and how will we manage them?

3) Can dynamic ("real time") risk management contribute to improving process safety, and if so, in what way?

4) How can digitization, AI and data mining contribute to early identification of weaknesses in (complex) processes or support faster recovery of deviations?

5) What are the cyber safety risks within or between companies (or in chains) as a result of digital connectedness and how will we manage them?

As a special topic, "ethical fading" was also added. Ethical fading blurs safety standards in favour of all kinds of self-interest. This in turn leads to unsafe behavior. A better

[12] https://www.safetydelta.nl/innovatiecentrum/

understanding of this phenomenon and what can be done to avoid it is therefore crucial for further improving the safety performance.

For a number of these research questions (small) projects are already in progress. These will result in new knowledge that can be implemented by industry.

The SDN - projects

SDN projects could be initiated through the knowledge centre or the innovation centre. We aim to only do those projects that are supported by the three parties: industry, government and science. Typical project scopes include the development of methodologies for risk assessment, tools or guidance for implementing risk controls, or technical innovations.

The SDN uses a project approach that is built up from several phases: idea, concept development, detailed development, implementation. After each step, a decision is made whether or not to go ahead and deploy more resources. Currently, the funnel contains about 25 projects in which there is SDN involvement. So far 11 projects have been completed.

The web portal also provides public information about current and completed projects. Project results will be widely communicated and are added to the knowledge collections.

Conclusion for now..

I believe that further improvements in health and safety, in loss prevention, can only be achieved through cooperation between government, industry and science. We jointly need to work at the system level.

I see three enablers for that:

1. Working in getting the right regulations. These should be based on minimum requirements (standards) and supported by clear guidance. These standards for minimizing risks to a level that is tolerable to society should be jointly agreed between parties.
2. Driving for strict compliance to those minimum requirements for a 'level playing field' in industry and for becoming trusted by society. Inspection and enforcement by the regulatory bodies as well as internal assurance by companies play a key role here.
3. Creating a safe space for experimenting with new practices and innovations that go beyond these minimum requirements.

The SDN has made a start in collecting and making available knowledge. That is the easy bit.

The SDN also found a niche in scoping and managing (small) projects, and stimulating implementation of outcomes in industry. In particular this works for project scope that require cooperation of industry and government parties. Science effectively contributes by being the independent assessor of information and developer of methodologies. SDN acts as 'broker' in research ideas that meet needs of industry.

We now focus on getting access to experts and building user communities. We work hard on raising awareness through direct engagements. There are challenges. Due to the

previous COVID-19 measures, the now worsening economic situation, and experts retiring from industry, there is limited availability of people to participate in voluntary activities to further improve safety at sector level.

It will take time in getting users to systematically deploy available knowledge and improve risk controls. Hopefully we'll soon see reductions in unusual events or non-compliances in meeting regulations. Ultimately, through cooperation we'll meet our ambition of ZERO serious incidents involving hazardous substances.

Thank you for your attention.