

Risk chains

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In the night of Friday 3 on Saturday 4 May a freight train derailed near the Belgian town of Wetteren. A number of wagons overturned and caught fire. Some wagons contained acrylonitrile, a highly toxic and flammable substance. From the damaged wagons this substance was released. Additionally decomposition products arose such as nitrogen oxides, hydrogen cyanide (prussic acid) and ethyne (acetylene). Although these products are also dangerous, for security reasons it is recommended to let acrylonitrile burn a controlled way¹, because the smoke is less harmful than the product itself. This means that no attempt is made to extinguish the fire, but that the surrounding is protected by cooling using water. This is the strategy the fire brigade applied. In the case of Wetteren that was certainly necessary because some other wagons contained butadiene, a highly flammable substance. Luckily these wagons did not catch fire, because when they would be heated strongly an explosion could occur.

Due to of the risk of explosion the area around the fire was cleared. Outside the ring around it the residents were advised to stay indoors and keep windows and doors shut. The first measurements indicated the smoke was not harmful. Unfortunately this was not the only way the residents could be exposed to the toxins. The water with which the fire was controlled flushed into the sewer and took the toxins with it. These toxins again were released elsewhere. As a result many people were injured and at least one person deceased. Eventually it was decided to conduct a very large-scale evacuation, involving nearly 2,000 people had to leave their home for a few days², some even two times. At this moment a number of them may still do not be back home. Also the rail traffic along the location of the accident has not yet recovered. All in all a very dramatic result of a derailment.

What in any case is striking about the coverage of the disaster is the poor communication. This is even stated by the responsible governor³. But the message of footnote 1 also contained the statement of the governor that the train driver was not to blame, while that turned out to be the case. It appeared the train drove must faster than was allowed. Here the wise lessons of communication as we mentioned in the previous column did not seem to be applied.

Yet the most amazing is not the communication, but the huge chain of errors, mistakes and accidental circumstances which eventually led to the disaster. The most concrete beginning of the chain is the train driver who exceeded the speed limit. Then the train derailed, causing fire hazard. In accordance with the safety insights this fire is not extinguished, but it is decided there will be a controlled burn. The cooling water containing dangerous substances flushes away through the sewers and thus causes dangerous situations far from the accident. However, this is not immediately recognised. The evacuation is limited to the first zone, and in the second zone people had to keep doors and windows closed. But they were, perhaps because they had to keep the windows and doors shut, exposed to hazardous substances. This lead to injured people and unfortunately a dead person.



¹ http://www.hln.be/hln/nl/16376/Treinramp-Wetteren/article/detail/1626693/2013/05/04/Dode-en-33-gewonden-na-treinongeval-Wetteren_dhtml (in Dutch)

² http://nl.wikipedia.org/wiki/Trein_-_en_giframp_bij_Wetteren

³ Briers calls second evacuation an 'emotional mistake', http://www.standaard.be/cnt/DMF20130513_00579599

In such a long chain there are many ways to prevent or limit the disaster, or at least in size. An earlier and larger evacuation had prevented victims as a result of the sewer. Perhaps could be prevented that firewater flushed into the sewage system. Or maybe there was not needed to use water. But the most important option to prevent the disaster of course was that the train driver did not exceed the speed limit.

Yet the question is whether it is so simple. Is the start of the chain the behaviour of the train driver, or is there another mechanism? It is clear from reports of the accident that the train driver at one point (about 100 meters before the rail intersection) realised he was speeding but then he could not inhibit⁴. But how is it possible that he drove too fast? Is there no automatic braking of trains which are speeding? As we reported in an earlier column⁵, if a driver does not respond within the distance he can see you must ensure that a system automatically intervenes. And if there was no automatic measure, how did one ensure that the driver was aware of the speed limit on the track?

An even more fundamental question is whether such a dangerous cargo train should be allowed or that additional measures should be applicable. There is often talk about a separate track, but it may be required of other means (such as a lower limit) for trains carrying dangerous goods.

An option which is close to it are custom containers which do not leak (or at least less) if a train derails. Oil tankers now all have a double hull to prevent leakages after collisions. Something has to be possible for containers?

But the most fundamental question is whether the way of thinking about risks is correct. The rail manager states that its signals around the accident site met the requirements. The carrier states that European standards for the transport of dangerous substances were followed. The fire brigade has extinguished in accordance with the applicable insights. The contingency plan was applied with what is customary, including all communication errors to be expected. Only, the sewer manager himself was completely innocent and was not involved previously. But right there problems arose.

From a distance thinking in silos might be the real culprit. Now this is of course mentioned more often, with the corresponding medicine an integrated approach in which everything is discussed with all involved. Only, that is such a juggernaut that it does not work. But is this the only way of break the thinking in silos? Isn't there a milder compromise possible? Consider the track manager who takes into account that signals are missed, carriers pondering what the consequences of a derailment could be and a fire brigade which not only extinguishes the fire but also thinks about where the fire water is going afterwards. If each party would just consider the next party in the chain, a lot less trouble may occur.

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⁴ <http://www.nrc.nl/nieuws/2013/05/07/nederlandse-machinist-van-trein-wetteren-reed-veel-te-snel/>

⁵ See column 'Decisions on safety'